SEP 2

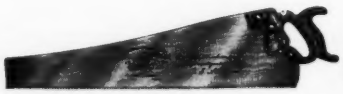
The INDUSTRIAL-ARTS MAGAZINE

OCTOBER
1926

THE BRUCE PUBLISHING COMPANY
MILWAUKEE - WISCONSIN

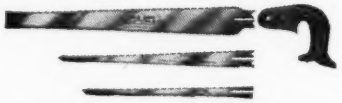
ATKINS SILVER STEEL SAWS

A Perfect Saw for Every Purpose



"THE 400" SHIP PATTERN
"The 400" is made of Silver Steel, Mirror Finish, Solid Rosewood handle Perfection Pattern, which prevents wrist strain.

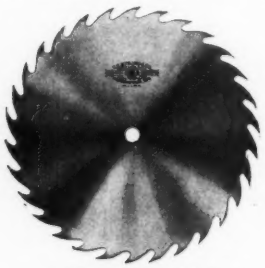
ATKINS No. 53 REGULAR PATTERN
A most popular Atkins saw, No. 53, Silver Steel blade, Damaskeen finish, handle of Applewood, Perfection Pattern, embossed. Each work bench should have a No. 53.



ATKINS No. 3 NEST OF SAWS
Atkins No. 3 Nest of Saws is very popular in schools where high grade tools are appreciated. 12 inch keyhole blade, 14 inch Compass blade, 18 inch Metal Cutting blade, with interchangeable handle.

ATKINS No. 1 MITRE SAW
The fine quality of Atkins Silver Steel is also found in our Mitre Saws. 4 inches to 6 inches under back to tooth edge and in lengths of 18 inches to 32 inches. Genuine Applewood handle.

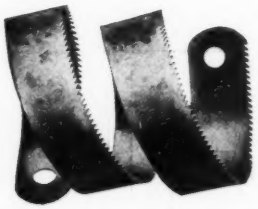
Atkins Silver Steel Narrow Band Saws are recommended for better and accurate work. Made in widths of ⅛ to 1¾ inches. Try a pair.



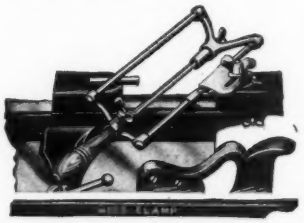
ATKINS SOLID TOOTH CIRCULAR SAWS
For your circular saw table Atkins Silver Steel Circular Saws cannot be beat. The results from using Atkins will prove absolutely that they are "The Finest On Earth."

ATKINS GRINDING WHEELS
Acrolite Grinding Wheels for saws, knives and tools. Ferrolite Grinding Wheels for brass, copper, chilled iron, etc. Send for our Grinding Wheel book.

ATKINS BLUE STAR KNIVES
Atkins Blue Star High Speed Steel Knives; the latest development in high grade machine knives. They have no equal for wearing and cutting qualities.



ATKINS NON-BREAKABLE BLADE
To those who have suffered a heavy loss on account of breakage the Atkins Non-Breakable Hack Saw Blade will prove extremely profitable.



ATKINS HAND-SAW FILER
Every school should have at least one Atkins Hand Saw Filer. Easily operated by the youngest mechanic.

Atkins Always Ahead

The Finest on Earth

We have just issued a new book entitled "Atkins Text Book" of Hand Rip and Panel Saws for Manual Training Schools. Write for a copy. It illustrates and describes proper methods of sharpening and setting saws to obtain good results.

E. C. ATKINS & COMPANY

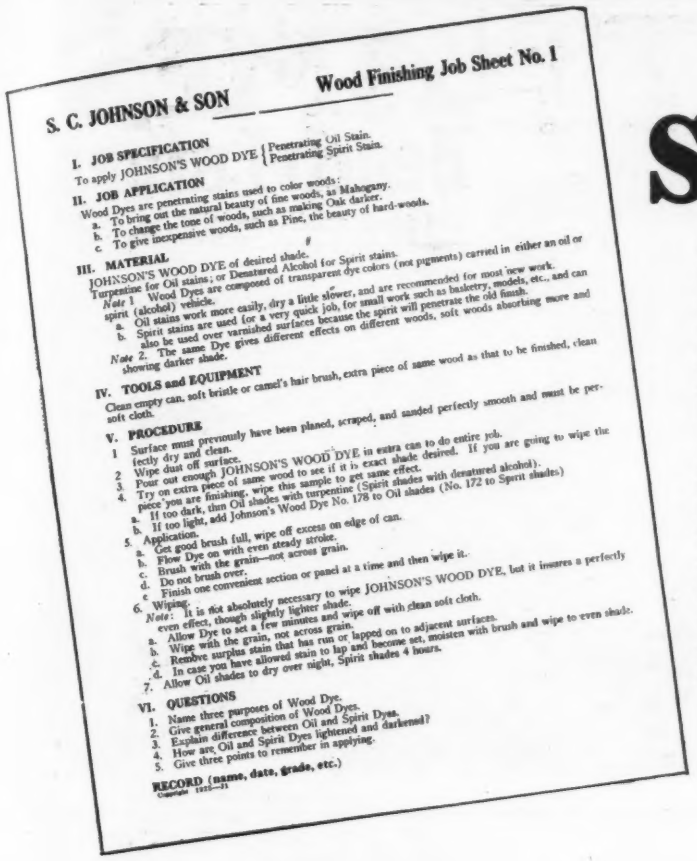
Established 1857 — ***The Silver Steel Saw People***

Machine Knife Factory: Lancaster, N. Y.

Home Office and Factory: INDIANAPOLIS, IND.

Canadian Factory: Hamilton, Ont.

Atlanta
New York
New Orleans
Minneapolis
Seattle
San Francisco
Portland
Memphis
Chicago
Vancouver, B. C.
Paris, France



S. C. JOHNSON & SON — Wood Finishing Job Sheet No. 1

I. JOB SPECIFICATION
To apply JOHNSON'S WOOD DYE { Penetrating Oil Stain. / Penetrating Spirit Stain.

II. JOB APPLICATION
Wood Dyes are penetrating stains used to color woods:
a. To bring out the natural beauty of fine woods, as Mahogany.
b. To change the tone of woods, such as making Oak darker.
c. To give inexpensive woods, such as Pine, the beauty of hard-woods.

III. MATERIAL
JOHNSON'S WOOD DYE of desired shade.
Turpentine for Oil stains; or Denatured Alcohol for Spirit stains.
Note 1. Wood Dyes are composed of transparent dye colors (not pigments) carried in either an oil or spirit (alcohol) vehicle.
a. Oil stains work more easily, dry a little slower, and are recommended for most new work.
b. Spirit stains are used for a very quick job, for small work such as basketry, models, etc., and can also be used over varnished surfaces because the spirit will penetrate the old finish.
Note 2. The same Dye gives different effects on different woods, soft woods absorbing more and showing darker shade.

IV. TOOLS and EQUIPMENT
Clean empty can, soft bristle or camel's hair brush, extra piece of same wood as that to be finished, clean soft cloth.

V. PROCEDURE
1 Surface must previously have been planed, scraped, and sanded perfectly smooth and must be perfectly dry and clean.
2 Wipe dust off surface.
3. Pour out enough JOHNSON'S WOOD DYE in extra can to do entire job.
4. Try on extra piece of same wood to see if it is exact shade desired. If you are going to wipe the piece you are finishing, wipe this sample to get same effect.
a. If too dark, thin Oil shades with turpentine (Spirit shades with denatured alcohol).
b. If too light, add Johnson's Wood Dye No. 178 to Oil shades (No. 172 to Spirit shades)
5. Application.
a. Get good brush full, wipe off excess on edge of can.
b. Flow Dye on with even steady stroke.
c. Brush with the grain—not across grain.
d. Do not brush over.
e Finish one convenient section or panel at a time and then wipe it.
6. Wiping.
Note: It is not absolutely necessary to wipe JOHNSON'S WOOD DYE, but it insures a perfectly even effect, though slightly lighter shade.
a. Allow Dye to set a few minutes and wipe off with clean soft cloth.
b. Wipe with the grain, not across grain.
c. Remove surplus stain that has run or lapped on to adjacent surfaces.
d. In case you have allowed stain to lap and become set, moisten with brush and wipe to even shade.
7. Allow Oil shades to dry over night, Spirit shades 4 hours.

VI. QUESTIONS
1. Name three purposes of Wood Dye.
2. Give general composition of Wood Dyes.
3. Explain difference between Oil and Spirit Dyes.
4. How are Oil and Spirit Dyes lightened and darkened?
5. Give three points to remember in applying.

RECORD (name, date, grade, etc.)

JOB SHEETS

Have you ever wished for something that would save you half the endless explaining you have to do? Could your students use a clear, simple, *practical* outline that would enable them to do their job right and know WHY they are doing it?

Johnson Job Sheets on Wood Finishing cover the application of Stain, Filler, Under-Lac (shellac), Enamel, Undercoat, Wax, Varnish and Varnish Rubbing. They combine the latest and best educational practice with the most expert practical experience. And to all users of Johnson Finishes they are

FREE

Making the Most of Your Budget

How do you buy? A pint of this, and a gallon of that, just as the need comes? Just any "varnish" or "stain" somebody shoves across the counter? Sometimes good, sometimes bad?

Those boys learning to do things Right, deserve the Best—perfect materials and reliable materials every time. But the busy instructor or supervisor hasn't time to "shop." The easiest solution in the world is the Special JOHNSON SCHOOL ASSORTMENT.

This Assortment will take care of 99% of your shop needs. It will give your students the finest materials manufactured and the funds available for your department will go farther and enable you to accomplish more.

The Johnson's school assortment includes **FREE** demonstrating materials — display panels — Text-books —a complete set of Job Sheets for *every boy* in your classes. And it will save you money!

Ask about it NOW!

S. C. JOHNSON & SON, Dept. IA10, RACINE, WIS.
"The Wood Finishing Authorities"

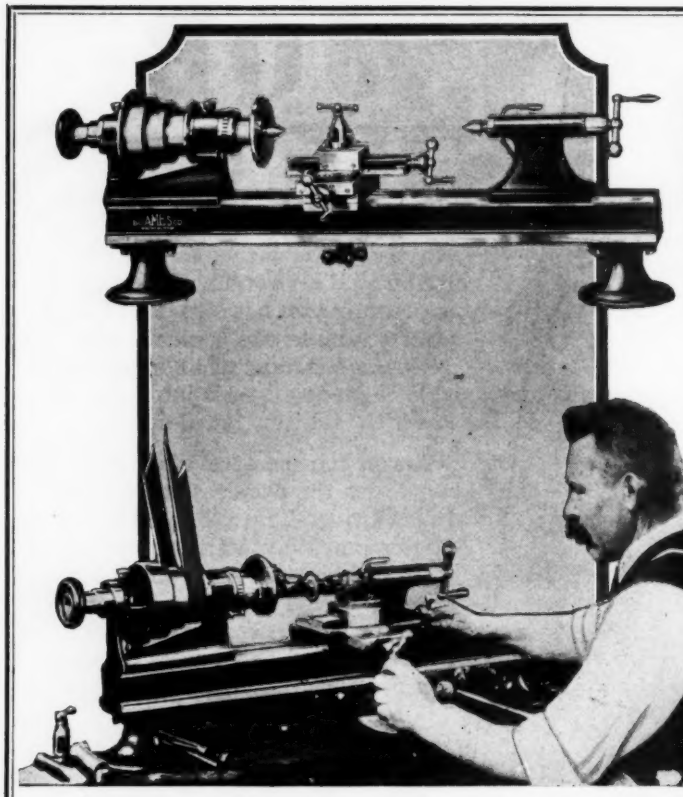
Please send me a specimen set of Johnson Job Sheets and all information concerning your Special School Assortment of Johnson Finishes.

Name .....

Position .....

School .....

City and State .....



AMES Bench Lathes

The ideal small Precision Lathe for every school shop—Practical and Accurate.

Send for "The Bench Lathe at Work"

B. C. AMES CO.,
Waltham, Mass.

Good tools help make good workmen

Here is a high speed ball bearing lathe which proves that safety is not incompatible with high speed, accurate work, and pleasing design.

While primarily designed for use in manual training schools, it is capable of turning out work which would delight the heart of the most fastidious craftsman. We sell many to schools on the basis that respect for good tools is an important part of any course in manual training.

The same high standards make our saw benches, planers, jointers, band saws and workers preferred by instructors who want their students to have the best there is.

Write for free booklet.

AMERICAN SAW MILL MACHINERY CO.
74 Main St., Hackettstown, N. J.
1374 Hudson Terminal Building, New York City
American Manual Training Equipment

NO. O HAND MODEL "D" GRINDER

This model D hand grinder has been one of our largest sellers.

Used for general hard work taking burrs off castings, smoothing off welds, etc.

4" x 1" or 3" x 1½" wheel. (4,000 R. P. M.) Grasp Handle with left hand and direct wheel with right, or vice versa.

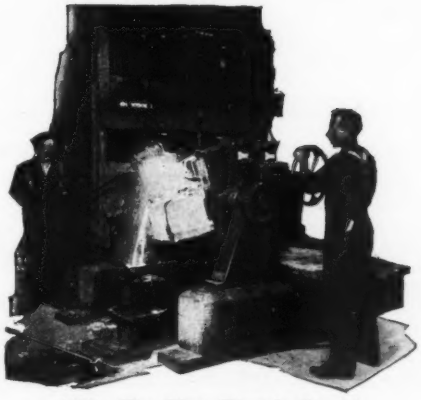
ILLUSTRATED CATALOG ON REQUEST.

JAS. CLARK, JR., ELECTRIC COMPANY
605 E. Bergman St. Louisville, Ky.

"First in the Field"

What Disston Leadership in Steel Means to the Instructor

1855: The First Crucible Saw Steel in the United States was melted by Henry Disston in his own plant.



1906: The First Electric Steel in America was Disston-made.

Seventy-one years ago Henry Disston melted the first Crucible Saw Steel in the United States. Thus the Disston Steel Works was founded.

Again in 1906 Disston Steel makers pioneered in the art of making fine steels. Disston, in that year, cast the first heat of Electric Tool Steel in America.

Today Disston Crucible-Electric Furnaces pour six to twelve thousand pounds of fine steel at a heat.

Leadership! Saw maker and Steel maker working side by side for 71 years! What does this mean to you?

It means this: Disston can control the quality and uniformity of Disston products. That Back Saw which has given you fifteen years of service . . . you can buy another like it today. Or hand saws, hack saw blades, band saws, circular saws, and on down the list of Disston Tools for Schools, —there's no question about the results you will get in the school work-shop.

To specify Disston Tools is to know in advance what you are getting in quality, workmanship, performance.

HENRY DISSTON & SONS CO.

Makers of "The Saw Most Carpenters Use"

PHILADELPHIA, U. S. A.

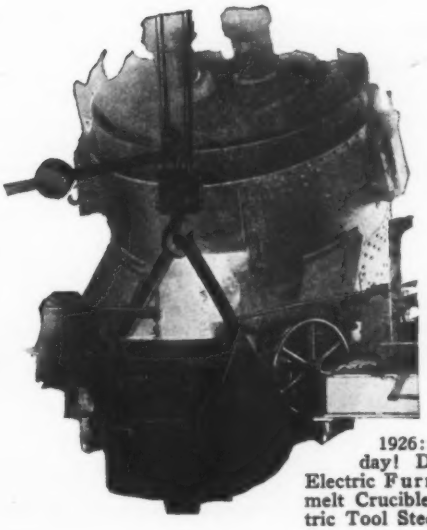
DISSTON

Disston Hack Saw Blades

Made in either Chromol (all-hard) or Duraflex (flexible). Made of a harder, tougher steel worked out by Disston Steel makers. Teeth are cut at a special angle that makes cutting easier. Every third tooth is a "cleaner" tooth to carry out metal chips. Teeth are set at a special angle to give better clearance. No binding in the cut with Disston Blades, but fast, accurate work and long life. Especially in school shops are Disston Hack Saw Blades needed.

Disston No. 200 Hack Saw

A good Saw for beginners' use because the low back steadies the saw, preventing breakage of blades. A handy saw also for cutting in close quarters. Takes 8-inch blades. Securely riveted at all joints.



1926: Today! Disston Electric Furnaces melt Crucible-Electric Tool Steel.

A SPRING TEMPER BLADE that will not break!
A Blade on which the loops will not pull out!
A POLISHED BRIGHT HIGH CARBON BLADE!

IN SHORT

A TRIPLE DUTY BLADE; Just the Blade for Schools

The "GRIFFIN" HEAVY BENT END COPING SAW BLADE No. 14

6 inches long Polished, for use with Wire Frames.

One of these Blades will outlast many of the ordinary type of Black Blades, yet cost but little more.

Dealers will supply these Blades, or write for price to

Sole Selling Agents

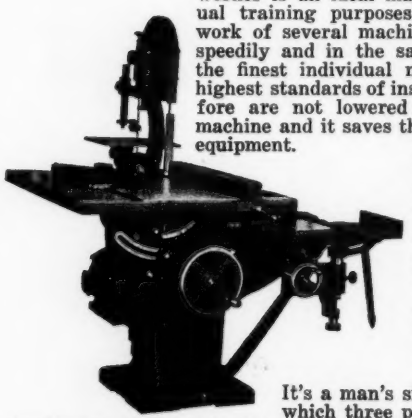
Also
"GRIFFIN" FRAMES
"GRIFFIN" BLACK BLADES
"GRIFFIN" PIN END BLADES

JOHN H. GRAHAM & Co. Inc.

113 CHAMBERS STREET
NEW YORK

Pacific Coast Office: 268 Market St., San Francisco

SAVE SPACE AND MONEY
SACRIFICE NOTHING!



The Tannewitz Combination Woodworker is an ideal machine for manual training purposes. It does the work of several machines accurately, speedily and in the same manner as the finest individual machines. The highest standards of instruction therefore are not lowered by using this machine and it saves the cost of much equipment.

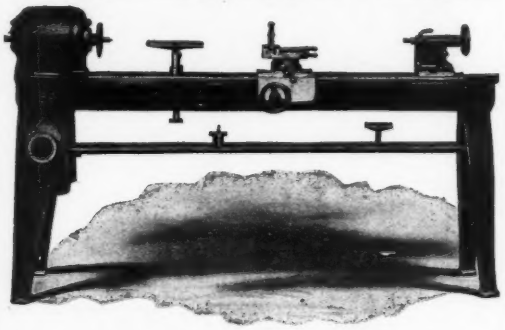
It will rip, cross - cut — mitre — bevel — groove — joint — dado — rabbet — plane — band saw — mould — mortise and bore.

It's a man's size machine on which three people can work simultaneously with absolute convenience and an unusual degree of safety; quality built in every detail—2 H. P. Motor—ball bearing throughout—completely guarded—attachments put in motion without shifting belts.

To fully appreciate this machine study it in detail. Write for bulletin E-2.

THE TANNEWITZ WORKS
FRONT AVE. GRAND RAPIDS, MICH.

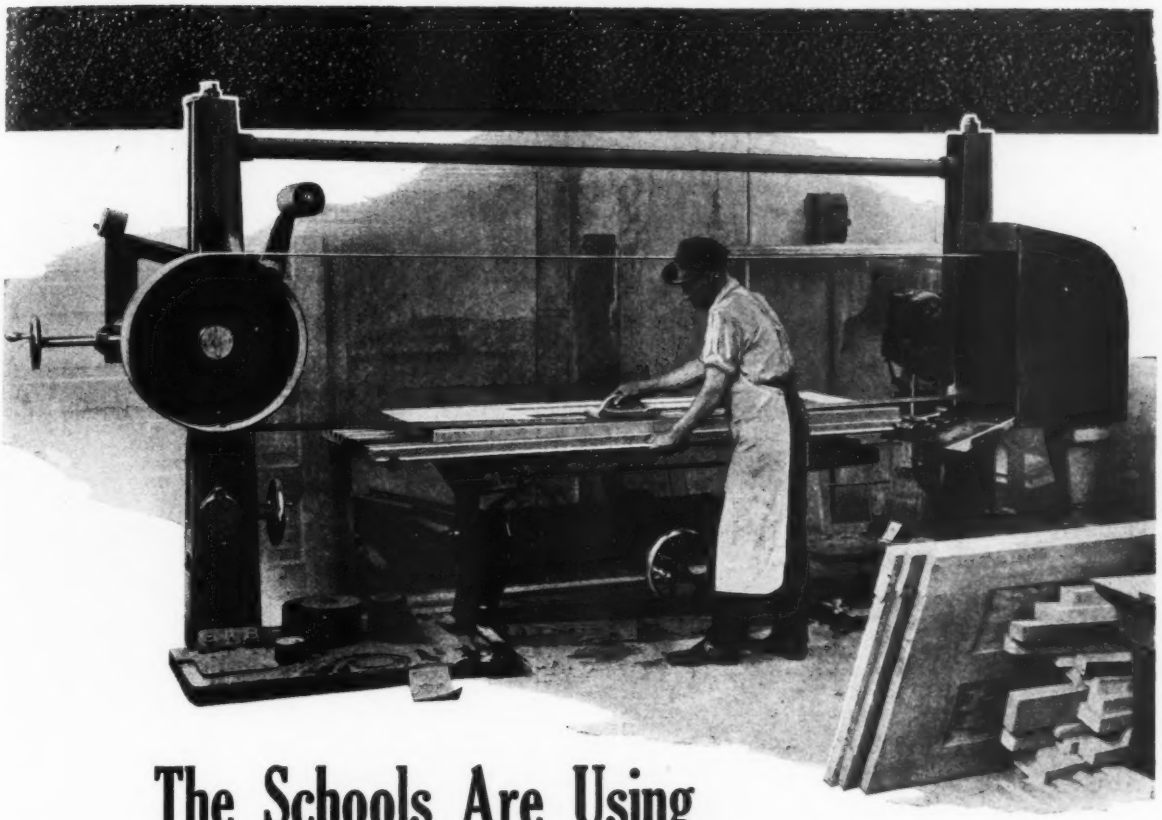
Manual Training Schools
MOTOR HEADSTOCK LATHES



We manufacture manual training school motor headstock lathes for either alternating or direct current; as well as a complete line of saw benches and planers. Two of the largest manual training schools in St. Louis have recently been fully equipped with our machines. Built to give service and as nearly fool proof as possible.

Write For Complete Information

Hall & Brown Woodworking Machine Co.
BROADWAY, TYLER, NINTH STS., ST. LOUIS, U. S. A.



The Schools Are Using "Oliver Belt Sanders"

Although the Belt Sander is a comparatively new development, its use in the industries is now practically universal.

The "Oliver" Belt Sander is made reversible. That is, the sand side may be run on the side away from the pulleys as shown in the illustration or the belt may be reversed and the sand side run next to the pulleys. For this the pulleys would be lowered. The tables roll on ball bearings, and large or small work can be sanded with equal facility.

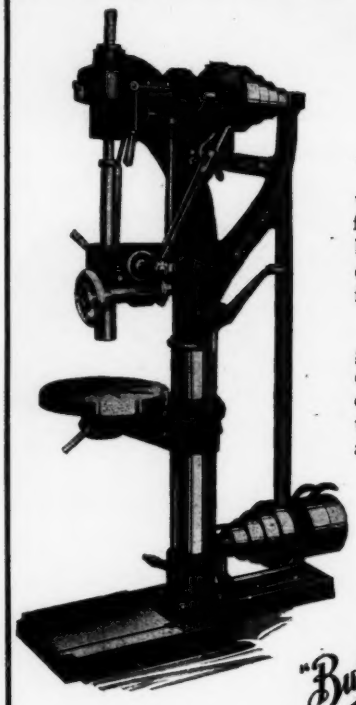
Such well known institutions as Berkey and Gay Furniture Co.; Tomlinson Chair Mfg. Co.; Ionia State Industries; G. R. Furniture Co.; Sparks-Withington Co.; Columbia Mantel Co.; G. R. Toy Mfg. Co., are sanding work in quantity and quality on "Oliver" Belt Sanders.

Such well known schools as B. of E., Worcester, Mass.; U. S. Veterans' Bureau, Vocational Sch., Waynesville, N. C.; B. of E., Dubuque, Iowa; B. of E., Cleveland; Carnegie Inst. of Tech., Pittsburgh; B. of E., Minneapolis, Minn.; B. of E., Youngstown, O.; B. of E., Yonkers, N. Y.; B. of E., Omaha, Neb.; B. of E., Fort Worth, Tex.; and many more progressive schools are making good use of their "Oliver" Belt Sanders.

Write us for illustrated circulars.

Oliver Machinery Company

GRAND RAPIDS, MICH., U. S. A.

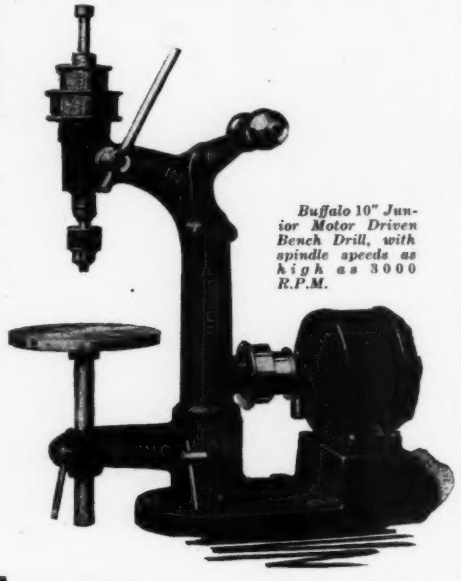


"He-Man" Machines
for the Mechanic-to-be!

Machines that'll do real work—just like the ones you find in regular shops. Built by the company that has equipped industrial shops for the last half century.

And built to stand the grief of hard usage by inexperienced hands. The clean-cut, rugged construction is the result of years of actual use.

Buffalo 21" Floor Drill, shown at the left, has eight different speeds, 3 power feeds, and hand and ratchet lever feeds. Base and table T-slotted and planed. Can be furnished with tapping attachment.



Buffalo 10" Junior Motor Driven Bench Drill, with spindle speeds as high as 3000 R.P.M.

Write for complete catalog.

"Buffalo" Shop Equipment

482 Broadway **Buffalo Forge Company** Buffalo, N. Y.

PEXTO GUIDE No. 25A

Free for the Asking—

SHEET METAL WORK—as an Industry—its Value as a timely Industrial Vocation for School Shops — the Projects — Aims of the Course — Sheet Metal Working Machinery — Application, and other things you would like to know are fully covered.

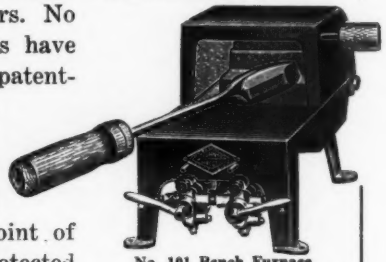
THE PECK, STOW & WILCOX CO.
Southington, Conn., U. S. A.

The JOHNSON Soldering Furnace

is used extensively by the Schools.

Because—

They are especially designed to heat soldering coppers. No other designs have the Johnson patented features giving more heat, quicker, with less gas. The point of the iron is protected and heated more uniformly by the curved hood and lined firebox.



No. 101 Bench Furnace

Do Not Require a Forced Air Blast.

JOHNSON GAS APPLIANCE CO.
Cedar Rapids IOWA

Pacific Coast Representative: C. B. Babcock Co., San Francisco, Calif.
Eastern Representative: R. M. Henshaw, 1189 Eddy Street, Providence, R. I.

A SATISFIED CUSTOMER RE-ORDERS

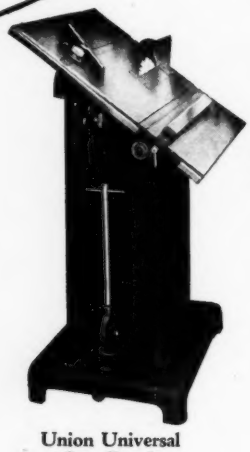
Carload Shipment UNION Machines
for Board of Education, Boston, Mass.

QUALITY PERFORMANCE

GALLMEYER & LIVINGSTON

GALLMEYER & LIVINGSTON

QUALITY PERFORMANCE

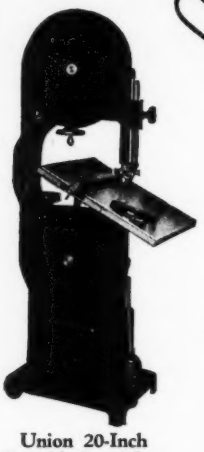


Union Universal Saw Bench

Has 25 x 26 tilting table, wide, powerful bearings. Will do most of the work at lower cost. Quick and easy of adjustment and dependable.

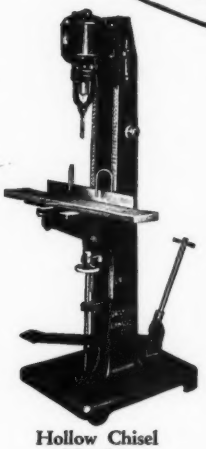
Union Portable Single Spindle Shaper

The value of a small machine cannot be appreciated more quickly than when using this small shaper. The operator can get so close to his work that greater accuracy is possible with a minimum of fatigue and eye strain. This machine will quickly demonstrate its ability to speed up production.



Union 20-Inch Portable Band Saw

This machine will do more than three-quarters of the work usually done on a large band saw and at a saving of time, investment, operating cost, trouble and floor space.



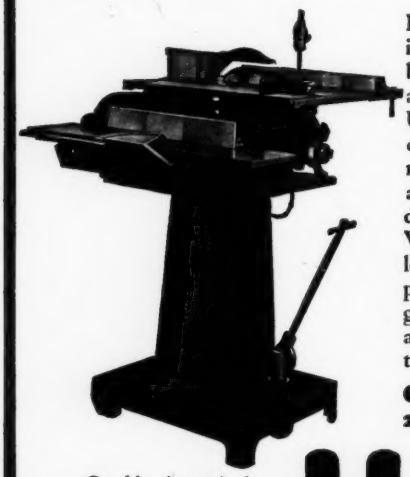
Hollow Chisel Mortiser

A machine that combines all of the advantages of a Vertical Boring Machine and Hollow Chisel Mortiser. Converts in a few minutes to a plain Vertical Boring machine merely by removing the chisel holder.

Enthusiastically Endorsed

Leading manufacturers everywhere are installing Union woodworking machines because they represent a lower first cost, and lower operating expense. In fact, Unions are doing their work at half the cost of larger and more expensive machines. Unions are compact, rugged and speedy. They are as accurate and durable as any machines you can buy. Where more efficient operation, and lower costs are necessary to yield a good profit, Unions are being installed. Begin now to enjoy these advantages. Sign and return the coupon with no obligation to you.

Gallmeyer & Livingston Co.
264 Straight Ave., Grand Rapids, Mich.



Combination 6-inch Jointer and Universal Saw Bench

A single portable machine. There is nothing to lock or unlock in changing from one unit to the other.

Union 6-Inch Hand Jointer

Costs less to buy and operate. Within their capacity, they are equivalent to any large hand jointer. They will do small work better at less cost.

UNION

PORTABLE AND BENCH TYPE WOODWORKING MACHINES

Sign and Return Convenient Coupon

GALLMEYER & LIVINGSTON CO.,
264 Straight Ave., Grand Rapids, Mich.

Send me your complete Catalog.

Name .....

Address .....

City .....

SIMONDS

For More Saw Service

School shops equipped with Simonds Saws—Narrow Bands, Circular or Hand, are getting greater service because these Saws withstand the wear and hold their edge longer. Planers running Simonds Knives will give more production and smoother work.

The New Planer Saw

This is a new type of circular saw, which makes practically as smooth a surface as when the wood is run through a planer. It stands heavy hand feed and does not burn the wood. Made from 6 inches to 24 inches in diameter. It cross-cuts or rips equally well. For fast results with hand feed get this saw.

Narrow Band Saws

Simonds Band Saws are made of tough steel that holds its edge and gives more service. They are carried in stock and you can get prompt delivery from any Simonds Service Station.

Planer Knives

Simonds are the largest makers of machine knives in the world. A Planer Knife bearing the Simonds Saw and Steel Co. trademark is guaranteed as to steel and mechanical construction. They hold their edge longer.

Blue Ribbon Hand Saws

You will make no mistake if you specify Simonds Blue Ribbon Hand Saws for school shop equipment. They are made of high grade steel that holds a keen edge under hard cutting conditions.

Order your equipment from Simonds

Simonds Saw and Steel Co.

ESTABLISHED 1832 — FITCHBURG, MASS.

CHICAGO, ILL.
BOSTON, MASS.
DETROIT, MICH.
NEW YORK CITY
NEW ORLEANS, LA.
LOCKPORT, N. Y.
MEMPHIS, TENN.
ATLANTA, GA.
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SEATTLE, WASH.
MONTREAL, QUE.
TORONTO, ONT.
VANCOUVER, B. C.
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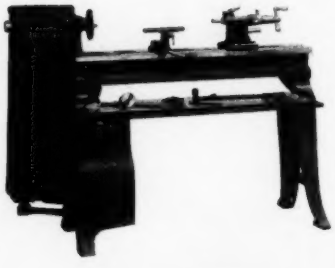

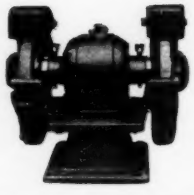

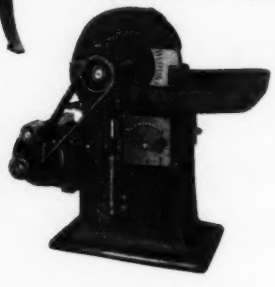

"Blount" Products

SINCE 1888

Dependability and Service

Blount Lathes and Grinders are the result of specialization and experience in the manufacture of a limited line of products. A consistent policy of undivided attention and striving to attain the best in lathe and grinder production has won this outstanding reputation for service of Blount Products. Simplicity of design, sturdy rigid construction, ample bearings, great load capacity, ease and safety in operation are built-in characteristics of Blount Products.

LATHES — 5 types — Variable Speed Motor Headstock, Motor-in-Leg, Motor-on-Rear-Shelf, Belt Countershaft Driven and Patternmaker's—floor or bench style—bronze or deep groove ball bearings —11"-13"-16" swing beds—3'-12' long.

GRINDERS—3 types—2-Wheel Floor or Bench Grinders, belt or motor driven, self-oiling or ball bearings—6"-18" wheels. Combination Grinders and Buffers, belt or motor driven, self-oiling or ball bearings, 8"-14" wheels. Wet Tool Grinders, belt or motor driven—self-oiling bearings with special centrifugal pump for water circulation, 14"-20"-30" wheels.

Descriptive catalog on request

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Everett Mass.

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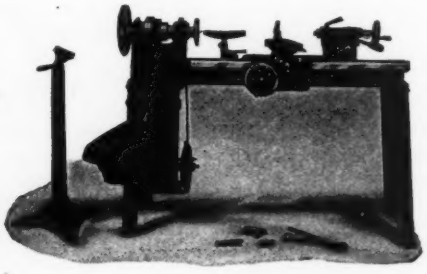
SCHOOLS USE "CLEVELAND" GRINDSTONES

For years "Cleveland" Grindstones have been a recognized necessity in every well equipped high school.

Manual training departments know that the Cleveland Stone Company products are dependable in school work and in industry. Write for particulars.

THE CLEVELAND STONE CO.
Union Trust Bldg. Cleveland, Ohio



Boys Love to Use a G.T.D. Lathe

It appeals to their creative instinct. They find in it a fascinating outlet for restless energy. With it they fashion wood and metals on a man's machine.

G. T. D. Lathes for school work combine the qualities of high grade production lathes with special school features that give economy, safety, and a wide range of capacity on wood or metals.

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GREENFIELD, MASS., U.S.A.

School Representatives

R. A. FIFE CORPORATION, Mamaroneck, N. Y.

Announcing— a new line of MILLERS FALLS LEVELS

TEN styles, in pine, mahogany, and aluminum, comprising a complete line of levels for carpenters and masons.

Whatever your needs in training boys to use tools, one of these ten models will meet them closely in price, material, and purpose.

Accurate, well made, handsomely finished, these new levels are true Millers Falls Tools. Can you ask for more?

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SINCE 1868

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Steel Sheets that Resist Rust!

The destructive enemy of sheet metal is *rust.* It is successfully combated by the use of protective coatings, or by scientific alloying to resist corrosion. Well made steel with an alloy of Copper will last longest. Insist upon

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Rust-Resisting
Copper Steel
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Keystone Copper Steel gives superior service for roofing, siding, gutters, spouting, culverts, tanks, and all forms of sheet metal work requiring highest rust-resistance. Send for *Facts* and other interesting booklets of value to shop instructors and craftsmen. We manufacture American Bessemer, American Open Hearth, and Keystone Copper Steel Sheets and Tin Plates for every use to which sheet metal is adapted—in industrial fields, in sheet metal shops, and for all lines of remanufacture.

Black Sheets for all purposes
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Our Sheet and Tin Mill Products represent the highest standards of quality and utility, and are particularly suited to the requirements of the industrial shop, and the particular sheet metal worker. Sold by leading metal merchants and distributors.

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No cutting tool is better than its edge
Keep the tools sharp

PLURALITY OILSTONE TOOL GRINDER

THE most convenient, serviceable and efficient tool sharpening machine ever made.

This new Tool Grinder has been carefully designed to combine many new advantages with the essential features of older models. It combines five basic units in one machine: *coarse oilstone wheel, fine oilstone wheel, grinding cone, leather stropping wheel, emery wheel,* and all accessible from two adjacent sides.

It is motor driven, ball bearing throughout, and every unit is thoroughly guarded.

Write for full descriptive bulletin.

MUMMERT-DIXON CO.
Hanover, Pa.
Originators and Pioneer Manufacturers of Oilstone Tool Grinders

Overlook This

and you overlook one of the best courses for Manual Training Workshops

A large number of the foremost schools in the country (public and private) have come to realize this fact and are teaching ***Sheet Metal Working*** in their Manual Training Department. They realize sheet metal is rapidly taking the place of wood in most every industry and mechanics knowing this trade are in great demand.

The work is healthful, the hours short, and pay ranks high among the best paid trades.

The initial equipment required costs far less than any other equipment you could install considering the results obtained. The supplies necessary to carry on the course cost very little.

We will be glad to furnish an estimate on sufficient machines and tools to cover your needs upon receipt of number of pupils to be taught.

At least send for literature on the subject.

BERGER BROS. CO.

"EVERYTHING FOR THE TRADE"

229-231-233-235-237 Arch Street,
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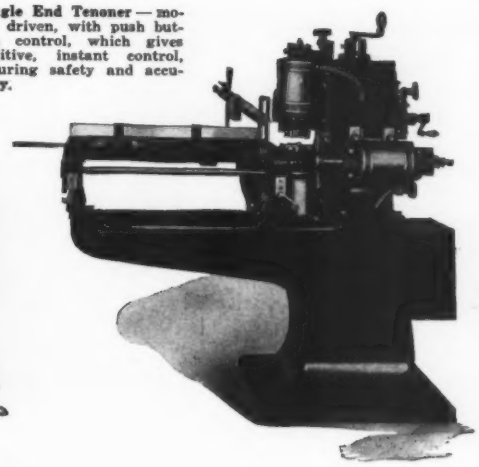
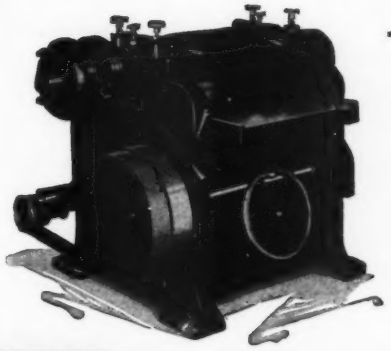
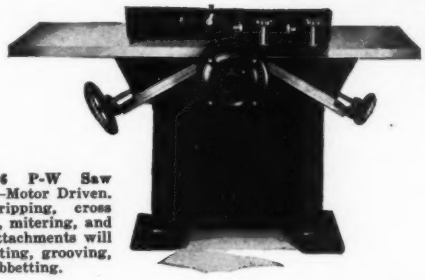


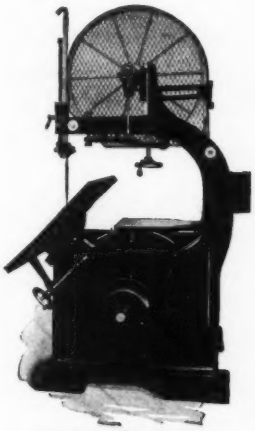
Single End Tenoner — motor driven, with push button control, which gives positive, instant control, insuring safety and accuracy.





Motor Driven Planer — supplied with all gears and pinions guarded as well as outside belts. All feed rolls power driven, preventing jamming and possible injury to operator.

No. 26 P-W Saw Bench—Motor Driven. Does ripping, cross cutting, mitering, and with attachments will do jointing, grooving, and rabbetting.



12 inch P-W Jointer —Direct Motor Drive. Simple, speedy, and easy to operate. Very difficult to get out of adjustment.

36 inch Band Saw—Motor Driven. Completely guarded. Frame cast in one piece. Easy to handle and hard to get out of order even in inexperienced hands.

If It's a Woodworking Operation

—there's a Famous that will do it.

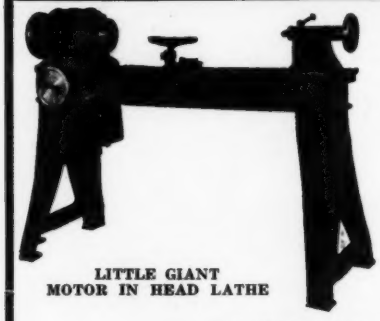
You don't have to shop around on woodworking machines. You can buy every machine your woodworking shop needs from the Famous Line—and know that you are getting the maximum degree of safety, accuracy, and value.

When you teach with Famous machines you are giving practical teaching. Thousands of the same machines are in use in planing mills, furniture factories, and other woodworking shops in every state in the Union. What the student learns on Famous machines he does not have to unlearn when he goes to work—for he finds in the production shop the same machines he worked with in the school shop. The safety features, the fool proof accuracy, the simplicity of operation that have made Famous machines standard in so many woodworking shops are doubly valuable in the school room.

Why not ask the Sidney Engineering Department to help you solve your shop problems? The service costs you nothing. Use it. Address Dept. 410.

THE SIDNEY MACHINE TOOL CO.

SIDNEY, OHIO



LITTLE GIANT
MOTOR IN HEAD LATHE

LITTLE GIANT WOODWORKING LATHES FOR SCHOOLS

are built in three styles. One style, our Model A, has the Motor Headstock; another style, our Model B, has underneath mounted motor; the third style, Model C, is belt driven. All come in any desired length from four feet to eight feet length of bed, centers two to six feet.

LITTLE GIANT BAND SAWS

are made either belt driven or motor driven and in sizes 12 in., 20 in., 24 in. and 36 in.

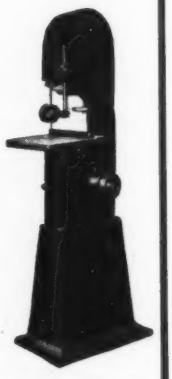
ARE THESE GOOD SHOP TOOLS?

That's what you want to know. And here's the only really sure way to find out. Install Little Giant Lathes and Band Saws and if at any time within thirty days they are found to be other than perfectly satisfactory, notify us and we will take them back and pay the freight both ways. This is an offer whereby you will KNOW. You don't depend on anyone's sayso.

WRITE US FOR CATALOG.

LITTLE GIANT COMPANY

223 Rock St. Mankato, Minn.



LITTLE GIANT
BAND SAW

THE EFFICIENCY GRINDER

A Modern Slow Speed Oilstone Grinder

Simple — Efficient

BUILT LIKE AN AUTOMOBILE

Bench and Floor Type Cone Wheel

Plugs Into Lamp Socket

MODERATE IN PRICE

Efficiency Grinder Company

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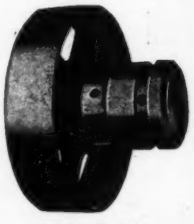
MADISON, WISCONSIN

THE JOHNSON FRICTION CLUTCH

Johnson Clutches Ideal For Use In Schools

Manual training departments in schools all over the country are getting splendid results by using JOHNSON Friction Clutches. The clutches give highly satisfactory service driving manual training machines from the lineshaft.

Drive your manual training machines direct from the line shafting through JOHNSON Friction Clutches mounted over every machine. Then any machine can be stopped while the others are running.



Single Clutch
Pulley Mounted

Give your students the benefit of this modern improved equipment. Starts the machines quickly; stops them instantly; controls them perfectly.

Manual training directors and school board members are invited to write us for our illustrated reprints. They tell all about high-grade JOHNSON Clutch installations in schools just like yours. Equip with JOHNSON Clutches.

Write for Catalog "IAM"

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

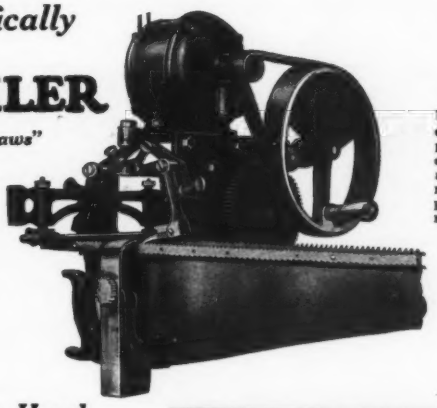
Good By Hand Filing!

File Your Saws *Automatically*

with the

FOLEY AUTOMATIC SAW FILER

"The only machine that files ALL your saws"



Don't waste your time and eyesight this year filing saws. If you have been sending them out to be hand filed, save that money for things you need. The Foley will handle all your saws in 1/4 to 1/6 of hand filing time—and make them perfect cutting tools.

30-Day Money-Back Guarantee

Use the Foley for 30 days right in your department. If it fails to convince you of its value after that fair test — return it and the full purchase price will be refunded.

Mail This Coupon NOW

More Perfect Work Than by Hand

It files hand, back, panel, band and circular saws with machine-like accuracy. The teeth are always cut evenly —saws last longer. Old saws can be retoothed as good as new. The Foley is simple and easy to operate. The picture here shows Model F-5, motor driven, filing a hand saw.

The coupon will bring you valuable and interesting information. Mail it today!

FOLEY SAW TOOL CO.
404 Foley Bldg., 920 East Lake St.
Minneapolis, Minn.

Send facts on filing saws automatically, with the Foley Saw Filer.

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Improve Your Shop Equipment

Huther Bros. Dado Head

A Huther Brothers Dado Head will speed up and simplify your intricate cutting and grooving. It consists of two outside cutters and enough inside cutters to perform the required cut. The cutters can be used in pairs or in any combinations desired.

Huther Bros. Cutter Head

Huther Brothers Round Cutter Head is especially desirable for jointing and running light mouldings on saw mandrels. The knives are set with the use of a headless set screw and flanged side plates strengthen the head and keep knives from twisting while being set.

HUTHER BROTHERS SAW MANUFACTURING COMPANY

Rochester, N. Y.

Makers of Better Saws for More Than 50 Years

Write for catalog No. 46 illustrating and describing the entire Huther Line.

The No. 10 Crescent Saw Table is a sturdy, substantial machine with every convenient adjustment for general factory work and will meet every requirement for a practical saw table with self-contained motor for your manual training department.

Send today for circular giving complete description. Also ask for circular of band saws, saw tables, shapers, jointers, variety wood workers, planers and matchers, disk grinders, cut off table, swing saws, borers, hollow chisel mortiser, tenoner, universal wood workers, self feed rip saw.

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The rate for classified advertisements is $.07 per word per insertion, payable in advance. All wants subject to approval. Minimum 25 words. Forms close on 5th of the month preceding date of issue. Write for discount on yearly insertions.

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Things to Paint — Polychrome, plaques, pictures, Gesso, Italian Clay, modeling wax, celluloid novelties, parchment shades, glow beads, water color cards and mottoes. Catalog Free. Coover Studios, Lincoln, Nebr.

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Basketry Materials—We carry a complete line of basket making materials including Kindergarten reeds, all sizes, round and flat, in one pound packages. Our line includes raffia, French willows, straw braids, Hong Kong twisted grass, basket bases, rattans, chair cane, dyes, etc. The Jayson Company, Inc., 217 Mercer St., New York City.

Basketry Materials—We have everything for basket making, including reeds, willow, chair-cane, Indian splints, ash splints and wooden bases. Send Fifteen Cents for Samples, 65-page Catalogue and directions. This contains illustrations of over 500 baskets, trays, frames, etc., with suggestions as to making them. Lewis Stoughton Drake, Inc., 33 Everett St., Allston, Boston 34, Mass.

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Finest Quality—We have cane, reed, webbing, flat rush, for all kinds of chair caning. Send Fifteen Cents for Samples, Directions and Catalogue. Louis Stoughton Drake, Inc., 33 Everett St., Allston, Boston 34, Mass.

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Art Fibre—See our full page advertisement regarding our complete Art-Fibre Weaving Service, Art-Fibre Cord, Stakes, Furniture Frames, Finishes, etc. Write for descriptive Folder. Grand Rapids Fibre Cord Company, Grand Rapids, Michigan.

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We are the oldest reed importers in this country and solicit inquiries. Wholesale only. Also handle Chair Cane, Rattan, Willows, Hong Kong Grass, Dyes, etc. The Otto Gerdau Co., 14 Lispenard Street, New York City.

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We have a wide variety of Tapestries and Velours, in all sizes, styles and designs. It will be a pleasure to send samples. Write us your wants. F. A. Rauch & Co., 410 S. Market St., Chicago, Ill.

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Workbenches—Steel Legs cheapest for school shop, private garage, radio room. Built durable and convenient. Descriptive circular free. L. F. Perrin Company, Port Huron, Mich.

"Driving nails in *Sugar Pine* is a 'soft' job"—

says the "Super" to his "boys"

A veteran in woodworking,—the pattern shop superintendent speaks from long experience with all kinds of pattern woods, when he says "driving nails in Sugar Pine is a soft job." Nailing together the parts of a Sugar Pine pattern is comparatively easy work. Pattern makers can drive nails anywhere in Sugar Pine, quickly, and without fear of splitting or spoiling material.

Just a few short, snappy taps with the hammer, and the nails are fast, anywhere in the board,—right up to the very edge, if need be, and they stay fast, no pulling away to loosen the nails, no tears, cracks or splits. Put away the pattern, take it out anytime, it's ready for use, without a lot of tinkering and repairs. Such nail-taking and nail-holding qualities are requisites for a wood known throughout the world as the superior pattern lumber. Sugar Pine's other qualities,—uniformly soft, "corky" texture, close, even grain, light weight, freedom from warping, twisting or swelling, and glue holding, are other facts that identify Sugar Pine to the pattern maker as *genuine white pine.*

Order a small quantity of Sugar Pine, and make a shop test. See for yourself how it cuts, saws, planes and takes nails and glue. Then you'll use Sugar Pine as regular stock material, for all your pattern work. It is available everywhere, in grades and sizes to conform to your own pattern-making practice, and always of uniform texture and properly seasoned, ready for immediate use.

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We manufacture Black Walnut and other hardwood lumber, selling direct to schools.
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Consult us regarding your requirements
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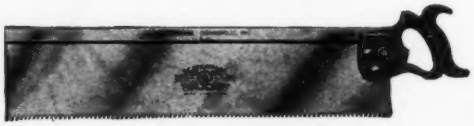

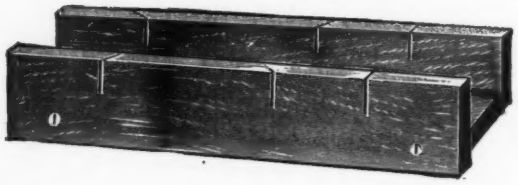

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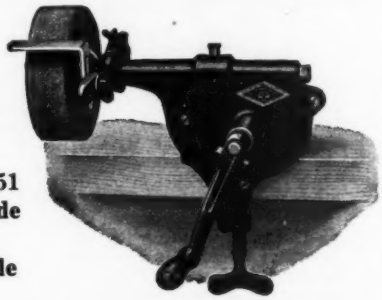

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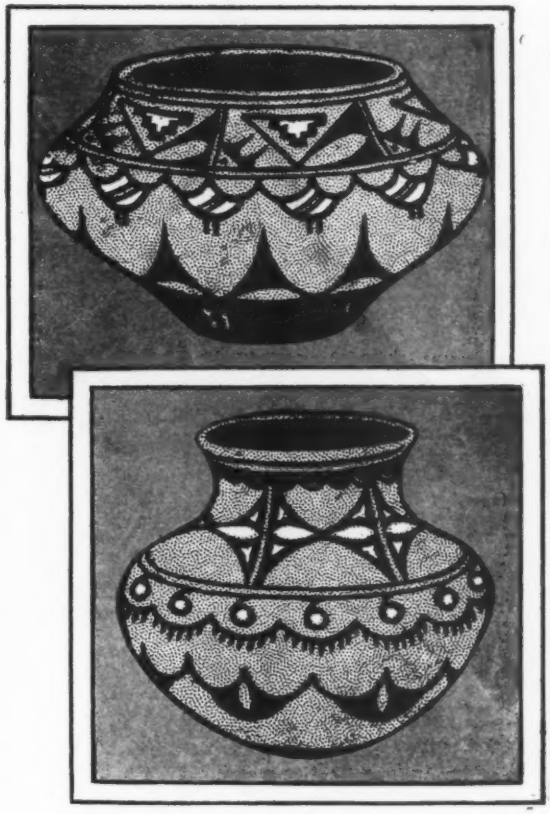

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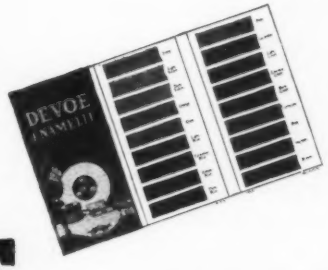

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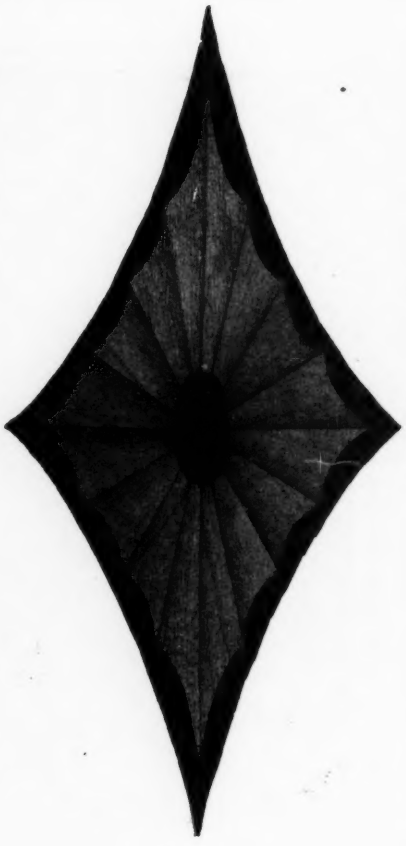

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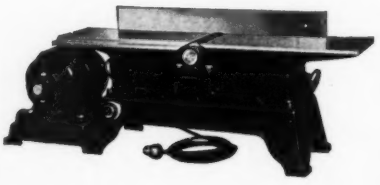

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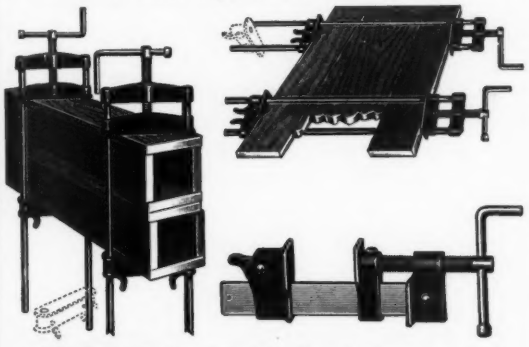

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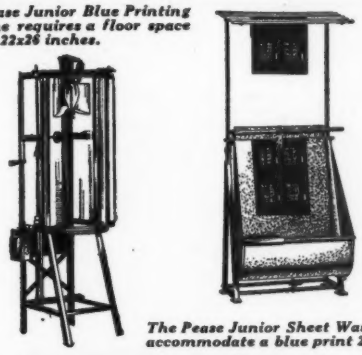

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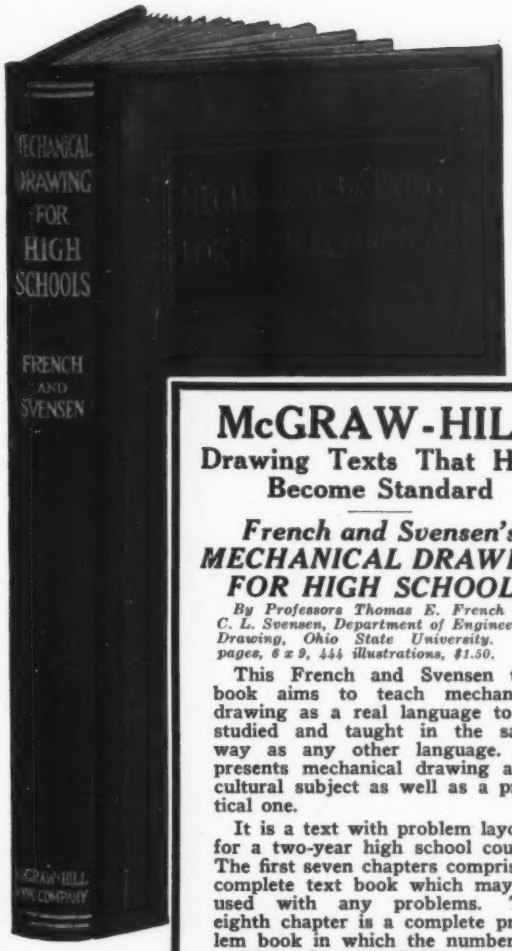

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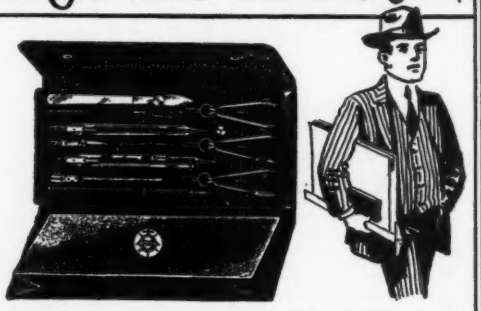

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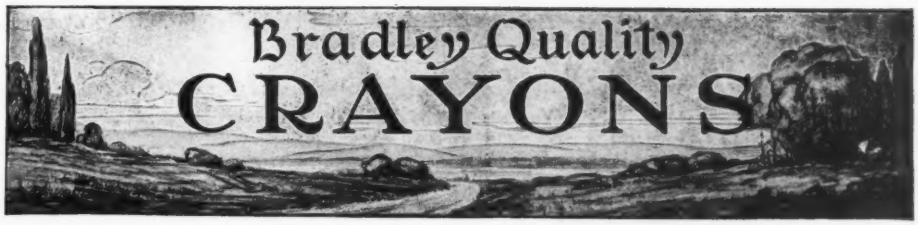

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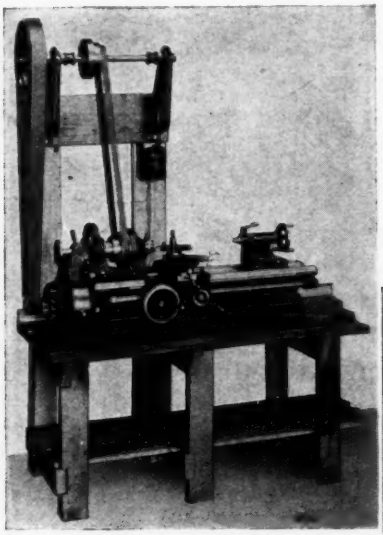

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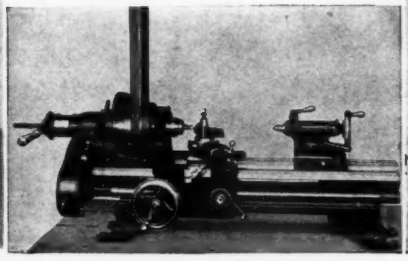

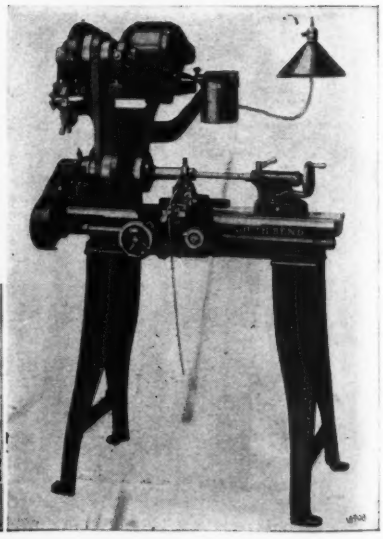

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Vol. XV
No. 10

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October, 1926

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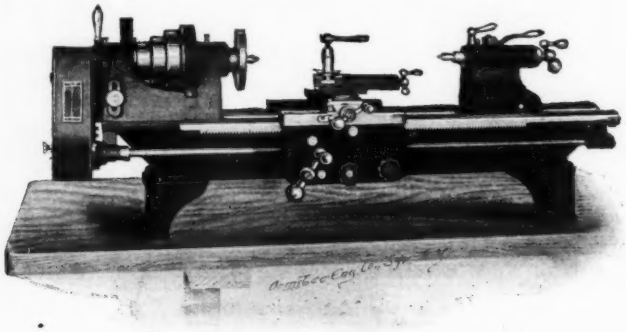

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Locating Difficulties in the Learning Process in Practical Arts Education

Robert Woellner, University of Chicago

ONE of the major problems of teaching is the making of a diagnosis of the difficulties which confront students in their efforts to acquire the skills and knowledge which we expect them to master. The teacher must know why it is that students fail of progress in a given period of time in order that he can assist them to assist themselves to a normal growth. To do this effectively the instructor must have clearly in mind all possible difficulties which might be handicapping the students, so that he can search intelligently for the cause of trouble. The teacher, just like the physician, must diagnose the case before a cure can be effected. In education the "case" is any individual who is not progressing as rapidly as he should be, in the light of his native abilities and his social advantages.

During the past year the writer devised and used a "trouble shooting" chart in connection with the teaching of mechanical drawing, which proved so effective that the possibility of using a similar chart for teaching pupils in shop subjects suggested itself. This type of chart proves useful in two ways. In the first place, it serves as an outline to guide the instructor's observation while diagnosing a case. Secondly, it is helpful in accumulating an ultimate list of difficulties that will make future diagnosing of cases more scientific.

Observing difficulties of pupils has its reward for the teacher as well as for the pupil, whose sole chance of improvement is in their discovery. Through studying the difficulties which students encounter while endeavoring to learn a subject, the instructor acquires a knowledge of the learning process which is not afforded him by any other means. The successful student does not indicate to his teacher how he learned, whereas the failure presents an opportunity to the teacher to find out the process, provided the instructor is willing to diagnose the situation.

While the chart which follows is more suggestive than it is complete, its organization has given evidence of being practical in assisting students to assist themselves. The basis upon which the major divisions are organized were suggested by the several aspects of the work. For the sake of clarity the major divisions and the subdivisions are discussed more in detail in the following paragraphs.

MECHANICAL DRAWING
INDIVIDUAL ANALYSIS SHEET
DATE.....192....
NAME .....GRADE .....
REASON FOR STUDY.....
.....
.....
.....

DIFFICULTIES

.....
Muscular Coordinations
.....
Lack of muscular controls.....
Lack of ability to concentrate on muscular controls
.....
Lack of interest to concentrate on muscular controls
.....
Evidences of poor habits previously formed.....
Does not follow rules essential to good work.....
Lacks ability to form habits.....
.....
.....
Analysis of Concrete Problems
Inability to visualize.....
Lacks space perception.....
Lacks ability to abstract.....
.....
Organization of Work Procedure
Inability to see results through step by step process to that result.....
Easily sidetracked after starting work.....
.....
.....
.....
Application of Academic Knowledge
.....
Lacks ability to translate statements into terms of concrete situations.....
Does not know theory.....
Does not know nomenclature.....
Cannot read.....
.....
.....
Attitudes
.....
Towards cleanliness.....
Towards sizes.....
Towards formation of letters and numerals.....
Towards joints in straight and curved work.....
Towards worth of finished job.....
Towards abilities that can be acquired through these jobs .....
.....
.....
.....
Other Difficulties
.....
.....
.....

1. *Muscular Coordinations.* All skills have their foundations in muscular controls and coordinations.

The "doing" aspect of mechanical drawing is a matter of careful movements that are peculiar to each instrument and combination of instruments. The psychology of work is largely the psychology of skills. To the extent that the "higher centers" or the intellect directs these movements and makes mastery or habit possible, to that extent we must take that into consideration. In some cases the lack of ability to get control of the body, from the neck on down, causes considerable difficulty in drafting and so it is that we must study it with a hope of determining what has gone amiss in the process.

a. *Lack of muscular controls.* By nature or nurture some individuals have the type of nervous and muscular system that will not work in an organized fashion no matter what effort is applied. These cases are rare. Numbers of students have an idea that they are more "clumsy" with their hands than they are in reality. Genuine effort must be applied before a definite conclusion should be reached.

b. *Lack of ability to concentrate upon muscular controls.* Skilfulness, as has already been stated, is a matter of the mental guidance of physical movements. The mind must be focused upon the movements to be made. The reason that man can make finer coordinations than a lower animal, is found, not so much in the difference of nervous and muscular structure as between the difference in cerebral controls. Paying attention to the proper movements so that the useless ones can be eliminated is essential to success in drafting, as it is in tennis or any other form of muscular activity.

c. *Lack of interest to concentrate on muscular controls.* Quite frequently a lack of interest to draw well is accounted for by failure to do well other things requiring physical skilfulness. During the year there were several boys, who were special cases in the unit of lettering, who gave as an excuse the fact that they were very poor in handwriting and had apparently accepted their limitations without an interest to improve. Lettering looked much the same to them as handwriting and what was the use? They acknowledged failure before they started and were not interested. After convincing them that poor penmen are always good draftsmen (a fact that still needs to be proved) they started into work and with added interest they made a success of lettering. The mental attitude we entertain affects our abilities along the line of muscular coordinations.

d. *Evidences of poor habits previously formed.* The formation of a habit is conditioned by the movements that preceded it. The student who has had previous experience in drawing and who has acquired faulty movements from it requires special attention in order that he might not only overcome the handicap that the previous experiences have given him but that he can proceed as one who is just beginning.

e. *He does not follow rules essential to good work.* 1. General physical attitude forms a general background for the formation of the more refined muscular coordinations. 2. Proper adjustment of the drawing table is likewise a secondary measure of success in drawing, and if ignored handicaps the student. 3. Again, the position for drawing in relation to the direction of the light contributes to the success or failure in drawing. If these and other rules are violated by the student, he is working against himself and does not appreciate the handicap. A diagnosis will call this to his attention and improvement will be sure to follow.

f. *Lacks ability to form habits.* For certain reasons a very limited percentage of children cannot make automatic the movements in connection with certain work. The writer has had experience with one such individual. He gave evidence of putting as much thought into the filling of a ruling pen with ink the last day of school as he had the first time he attempted to do it. Drawing of an ink line was likewise as laborious a process at the end of the course as at the start. His muscular coordinations were apparently at all times conscious bits of activity and were never habituated. Success in drawing, as in all the other practical arts, depends upon our ability to form habits.

II. *Analysis of Concrete Problems.* Before attempting to draw an object one must be able to analyze it. One must abstract one part from the rest of the object in order to view it as a unit in itself. The top view must be seen as a thing apart from the rest of the object while it is under consideration. Likewise the front and side view must be observed as distinct and separate parts. These must be clearly held apart in one's mind before one can mentally picture them to make an intelligent drawing of an object. Students have difficulties in doing this for one of the following reasons:

a. *Inability to visualize.* Some pupils find it difficult to clarify and refine the mental picture which they have of concrete objects. A simple method to discover this inability is to give the pupil a verbal statement describing the size and shape of some simple object. Have him sketch what he considers to be the front, top, and side view of this object. One can see from the result what type of mental picture he had.

b. *Lacks space perception.* Placing a three dimensional object upon a two dimensional surface requires an ability to conceive space relationship.

c. *Lacks ability to abstract.* This item has been discussed above.

III. *Organizing of Work Procedure.* Thinking through a job before starting to work at it is quite frequently the outcome of experience. The large majority of drawings are successfully made only as they follow a step-by-step procedure of work. Because of the mechanical nature of drawing the one step out of place might spell failure for the entire drawing. If for instance one inks straight lines before arcs and circles, that unite with them, the chances for success in making the joints well are decreased many times. There are a number of just such situations in which orderliness of procedure is paramount to success.

a. *Inability to see results through step by step process to that result.* This suggests that a student have a certain "overview" of the drawing situation. He must be master of it, in order to see through to the end before he starts work.

b. *Easily sidetracked after starting work.* In some cases it is a lack of memory while in other cases the temptations to do the apparently more convenient thing leads them astray.

IV. *Application of Academic Knowledge.* To what extent the student can apply in a concrete situation, that which he possesses or that which he should possess is of great importance in the practical arts. The types of difficulties under this heading that might handicap the student are:

a. Lacks ability to translate statements into terms of concrete situations.

b. Does not know theory.

c. Does not know or understand nomenclature.

d. Cannot read.

V. *Attitudes.* One's habits of work largely reflect one's attitude towards it. Individuals are often unsuccessful because they either lack proper attitudes or because they have negative attitudes. To be sure, these are seldom so pronounced that they result in total failure. To the extent that they cause poor results, they should be discovered and an attempt should be made to correct them. The more important attitudes affecting work in mechanical drawing are attitudes regarding:

a. Cleanliness.

b. Spaces or sizes.

c. Formation of letters and numerals.

d. Joints in straight and curved work.

e. Worth of finished job.

f. Abilities developing from doing good work.

Although in many cases the discovery of the difficulty which handicaps a pupil might be beyond our ability, a goodly number of students can be more intelligently assisted by means of a more careful diagnosis than we can make off-hand. Methods and tests for ascertaining specific difficulties are as essential to a forward-looking program in scientific practical arts education as are the cures to be effected after the difficulties are known. If we assume that student failure is a teacher's responsibility, we have a challenge to investigate more fully the problem case in practical arts work.

Teaching Related Work in Vocational and Part-Time Classes

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II—Lesson Planning for Group Work

A WELL-TRIMMED show window may get customers into a store, but it cannot keep them there unless its promises are backed up by the stock. If we send the boy home at the end of the first day sold on the vocational or part-time school, our task is only begun—he must stay sold. Like the merchant, if the part-time school expects to retain its customers, it must be prepared to deliver the goods. This means that it must select for presentation a body of knowledge that actually does function immediately on the job or in everyday life; that it must use teaching methods suited to the type of students handled; that the part-time teacher before he begins work on the first day must know approximately where he expects to land the last day. Beside knowing *where* he is going, he must also know *how* he expects to get there, which means that he has or will have a definite, usable, carefully thought-out lesson plan *on paper* for every important item to be taught.

Mention of lesson plans at once brings up the inquiry, "Plans for group or for individual work?" For both, with the emphasis on the group work. Because of the wide variation in preparation and mental capacity to be found in the average part-time class much individual instruction is necessary, but class and group work should be used whenever and wherever possible, as a matter of simple economy.

The most important thing in regard to lesson plans that can be urged upon the attention of the novice is the necessity of making them. Even poor plans are better than none. Putting his plan on paper insures more careful thinking on the part of the instructor, keeps him to the subject during the recitation, and enables him after the lesson to check up by a glance the points that have been omitted, or that need further attention.

A "lesson plan" as the term is used in this article means a formally organized scheme for "getting over" to the class any definite portion of the work outlined in the course of study. The course of study shows *what* you are going to teach. The lesson plan shows *how* you are going to do it. One is as necessary as the other. Both are absolutely essential for successful work.

As every normal student is taught, the steps in a lesson plan divide naturally into two parts—the procedure outside the classroom, and the procedure before the class. Outside of the classroom the instructor must make all necessary preparation—determine his aim, ascertain his teaching content, decide upon his method, plan his approach, and outline the steps in his presentation that have been laid out, make the necessary application, and summarize or test, though the testing may be postponed for a considerable time after the presentation of the lesson.

Concrete Teaching Essential

In deciding upon his method—lecture, demonstration, text assignment, development, or otherwise—the instructor must not for a minute lose sight of the type of student with whom he is dealing. There is little place for the lecture method in any elementary school, and still less in the part-time classroom. The part-time boy is interested in things and not in abstract ideas; he must, when possible, do or see the thing he is to learn. Demonstration, dramatization, visual presentation through diagrams, pictures, specimens, slides and movies, all kinds of concrete teaching are necessary for him. Whenever it can be arranged, he should take personal part in the development of the lesson; Socratic questioning which leads him to discover things for himself is one of the most successful methods that can be used in his civics and English classes.

In determining content, the normal student is taught that he must first find out what must be known in order to perform the required operation or project; then he must determine what the student knows now; and from this determine what remains to be taught. This is much less complicated in practise than it sounds in the normal classroom, summing up to find out what new things are to be taught in this lesson, and then arrange them in logical order of presentation. In short, a non-technical summary of the whole lesson plan amounts to about this: Find out what you are going to teach, ask yourself why you are going to teach it, and then decide how you will try to "get it over." We take it for granted that no teacher is engaged to take charge of a part-time class without some professional training, consequently, any lengthy explanatory discussion of lesson planning will be omitted; the things stressed will be the points in lesson plans which differ for the part-time teacher, or that need special attention and emphasis for the part-time class.

Aims Important

The first step in making a good lesson plan is to state our aim. Stating aims before beginning to plan helps to clarify the instructor's thinking, and aids in cutting out unnecessary detail that does not lead directly toward the goal. Occasionally it may result in omitting a lesson entirely, because when we honestly ask ourselves, "What is the aim of this lesson? Why is it necessary?" the truthful reply may be, "The aim is unimportant. The lesson is not necessary—it is a time-filler." The part-time school cannot attempt to do in four hours a week what the day school tries to do in thirty. There are thousands of things that would be nice for the part-time boy, but our job is to select essentials—not the things that would be nice, but the things that are imperative—the things that he must have. Stating a definite aim tends toward singleness of purpose, helps to focus our energies instead of spreading them out. "Load with buckshot and you are sure to hit the target somewhere, but the chances are that you won't penetrate deeply. Load with a bullet and you may miss, but if you score a hit you've done something." The part-time teacher needs to load with a bullet.

A second step that may be neglected by the novice is to list the illustrative material, if any is necessary. Like every tradesman the part-time teacher needs a "tool-kit" when he comes on the job; they are cared for and preserved for future use when that job is completed. The beginner cannot be urged too strongly to preserve and file his lesson plans, his blue prints and drawings, pictures, posters, clippings, his normal school notebooks, trade advertising, his reports to supervising officers, his notes taken at teachers' meetings, and all similar material. Elegant files are not necessary. Manila folders for vertical filing can be bought at a small expense at any stationer's, and work just as efficiently in a corrugated board cracker box as in the most elaborate filing cabinet. Every part-time teacher should begin *now* to make scrap book and clipping collections. Tear out the item when you see it and preserve it—tomorrow may be too late. Preserve even the poor lesson plan with a candid report upon its non-success. If you know *where* the plan failed by the end of the year, you may be able to discover *why* it failed, and make a success of the same thing next time. Experience will prove to you that it is highly advantageous to preserve and file every discussion which you prepare for public presentation, as you frequently have opportunity to use the same material again, or to connect it with a different project later. "Plan your work, and work your plan," then by all means preserve that plan.

Necessary Essentials of a Plan

The form need not be elaborate—the simpler the better—and the roughest outline will suffice if it covers the ground. Even if it be the roughest of memoranda it should state explicitly the aim of the lesson, list the illustrative material, note the instructor's approach or approaches, and give a list of the teaching points in order as they are to be taken up. The part-time student has no time to waste, or to be wasted, and his instructor should make every minute count.

The part-time teacher must guard against every pitfall that lurks in the path of any teacher making lesson plans, but he must pay particular attention to two items; he must provide for an interesting introduction and for concrete treatment.

A teacher facing a new part-time class on the first day, after the study of the part-time law was finished, said, "Boys, one of the first questions that you probably want to ask is 'Why do we have to come to the continuation school?' I'm going to show you."

She counted the class—twenty—and sent three boys to one side of the center aisle, and the rest of the class to the other.

"Now, remember that I can't tell you which *people* will be in either group—all I know is the *number* that will be there—but statistics show that fifty years from now when most of you will be 65, the people of this little group will be self-supporting, and all of the people in the other group will be dependent upon charity for a

living, or dead, leaving no estate. *How do you like the idea?*

Of course, they did not like it at all.

"If you don't like it, what can you do about it? The group into which you will go depends entirely upon yourselves."

The group then discussed the probable reasons why people are dependent at 65, the teacher listing them on the board as the items were suggested by the class—extravagance, ignorance, idleness, illness, accidents, strikes, no trades, drink and drug habits, and so on. Then they were asked to think how many of these causes are preventable, and suggest possible remedies for them, the teacher listing as before. The class itself brought out the fact that in almost every case the remedy is education, "teach them to save; teach them safety first; teach them a trade" as they expressed it. This lesson has since been given at least a dozen times to high school, elementary school and part-time classes, without a failure. It makes a perceptible change in the attitude of some of the students, leaves a good lead for later lessons on thrift, and an excellent lead for next week's lesson on the necessity of trade training.

Another Type of Lesson

With the same group the first question in the development of a lesson on division of labor and the growth of the factory system was, "Who got your breakfast this morning?" asked casually of the boy in the front seat.

"My mother."

"Was she the only person?"

The answer was modified to "My father earned it."

"Did you have coffee? Who raised it?" .....

"How did it come from Brazil?" .....

"Who built those ships?" .....

"Who made their tools?" The fusillade continued for a minute or more, until it brought the conclusion, "Probably a million people worked before I could eat this morning."

Then, "Do you remember Robinson Crusoe? Who got his breakfast?

"Who made his clothes? Built his house?"

"We call the difference between Robinon Crusoe's work and the way things are done today 'division of labor'."

The ensuing discussion brought out without difficulty the effect of division of labor upon the time required to produce an article, the skill of the individual worker, price and uniformity of product, etc., the teacher listing on the board as the class suggested. The lesson ended in a brief summary of the reasons why the tramp and the loafer are bad citizens, even if they commit no crimes. The same introduction has been used a dozen times both in day school and continuation school classes, while the development varies with the class, the recommended approach has never failed to work, because it fools the boys to begin with, and the joke upon themselves wakes them up to the discussion.

These two illustrations are presented because they have actually worked a number of times. The part-time teacher must take care that the opening move in his attack upon any new lesson arouses interest immediately. You may be able to get results by saying to a high school class, "Study Chapter X until you understand the difference between citizens and aliens, and can describe the process of naturalization." The part-time boy is not built that way. *You can not set him to work to study a textbook unless you first give him a motive.* Suppose we start his lesson on "citizens and aliens" by telling him the story of Gus Rammi.

A Citizenship Lesson

"In July, 1920, Syracuse University was intercollegiate rowing champion. It had one more race to row to become national champion—if it outrowed the Navy it would be champion of the United States, and go to Europe to represent us in the Olympic games. If it won the Olympic it would be champion of the world. Every member of the crew was on his toes, for everyone was anxious to be part of a world championship crew. The most important man on the crew was the stroke oar, big Gus Rammi. The coach was depending upon him to bring the crew in victorious as he had before at Duluth and Ithaca, but there was trouble in store for Syracuse. Only American citizens can represent the United States in the Olympic games. Three days before the big race the Olympic Committee notified Coach TenEyck that Big Rammi could not row, because he was not an American citizen. At the last minute the crew had to be realigned, and Syracuse had to go into the most important race of the season with a green stroke oar. Syracuse lost by barely a boat length, and less than three seconds' time. *It could have won with Rammi,* who sat in the press stands and cried like a baby when he saw the defeat that he could have prevented. Syracuse had lost a possible world-championship—he, himself, had lost a chance to stroke a winning crew, all because he had taken his citizenship for granted."

"What was the trouble with Rammi? He spoke like an American, he wanted to be an American, and he had supposed he was an American. Why wasn't he? Because he had been born in a foreign country; his father had brought him to the United States as a tiny boy; but neither he nor his father had ever taken out naturalization papers."

"Are *you* an American? *Are you sure?*

If *your* father was born in a foreign country, how can you be sure?"

Those boys will study citizenship now, but they will not confine their study to Chapter Ten—the family dinner table will be apt to add its quota. Here is another trick that worked:

"Is your father going to vote for president next week, Tom? Yes? Yes? Is yours, William? Sam? Benjamin? Joe? Donald?

"What would you say if I told you that not one of your fathers will be able to vote for president next week?

There was a chorus of "Why not?" That class was awake, and there wasn't the least doubt about it.

"Suppose I tell you that Mr. John Murray is the only man in town who has ever voted for president? And that we will not elect a president Tuesday—not until next January? You can find out why on page 49. The first boy who can explain why may stand up."

Teaching presidential elections to that class was so easy that it could not be dignified by the name of work. They did not need drill and review either, because the general reaction was, "Let's go out and try this on the fellows downtown."

A Demonstration Lesson

With the same class the lesson on fire prevention in the shop began with the same kind of apparently casual question, "Boys, have any of you a box of safety matches?" Several had.

"Let me have yours, please, Robert. By the way, do you know how to strike one properly?"

"Well, I should think so!"

"Let's see you do it."

He lighted a match, striking it toward himself, with the box open.

"I was afraid you didn't. About half of the boys I know don't. Who knows what he did that was wrong?"

He repeated the performance twice before the boys saw anything to criticize and then the teacher held up a Travelers' Insurance Company poster illustrating the right way and the wrong. The ensuing discussion brought in other posters, and each poster led to further discussion, which was finally summarized in a blackboard outline, and used as the basis of several two-minute speeches.

Every one of these lessons is an example of the kind of "teaching tricks" that work with the part-time boy. Each one of them, with more or less modification to suit the class and the occasion, has been used again and again in part-time classes. They illustrate one other point also: Textbook study comes last in the part-time recitation period when it comes at all. The text should be used by the student to check up his own conclusions, or as a source of further information. It is not something to be learned and recited. Experience in part-time classes indicates that discussion should come first, text study afterward, during or as a part of the investigation. The text supplements the discussion, and sometimes answers the questions raised. The feeling of the part-time student who goes to a book to find the answer to something he wants to know is vastly different from that which follows, "Study page 9 until you can answer all of the questions," though the points covered may be exactly the same. Some abstract drill and some interesting material must be given to all classes. The part-time teacher should remember that when the material is not interesting *the method can be.* Corrective English games, time limits, contests between sides, help in getting drill material across. First show the class that the drill or practice is necessary, and then hammer it in by *short, intensive,* interesting drill periods.

The success of the lesson plan depends upon the ingenuity and resourcefulness of the teacher, but it also depends upon his knowledge of up-to-date and standard texts. Not every good "teaching trick" is original, and there is seldom a text so poor that at least one new and useful device cannot be found within its pages. The instructor should file his lesson plans after use, with absolutely candid comment upon their success and suggestions for improvement. Red ink additions or eliminations from time to time may indicate the development of better teaching technique, alternative approaches, and fresh illustrations, but while methods of presentation will vary somewhat each time a topic is presented, fundamental principles remain the same. In one sense the successful part-time teacher resembles a good actor—both have a repertoire, to which they add from time to time from many sources. The better they are, the larger the repertoire, and the teacher is fortunate in that it is perfectly ethical to borrow the other fellow's tricks.

Keep Teaching Concrete

The second point that the part-time teacher must remember in making lesson plans is to *keep his teaching concrete.* The average part-time boy does not think abstractly. Possibly he can, but he doesn't. If the method of presentation is not concrete, he will not "get it." This means that the part-time teacher must teach things, not words; that he must develop ideas instead of drilling in definitions or formulas; that he must lead the boy to think, and *make him understand instead of making him memorize.* It means really objective teaching, and oftentimes methods as dramatic as those used in the second grade. Take for instance the combined English and safety lesson on which was based the oral test on "switchboards." The teaching material for that lesson in one group was a series of safety posters from the National Safety Council, (showing right and wrong methods of using switchboard, man testing for current with his fingers, worker throwing switch and talking to someone else with his face turned away, etc.), and one boy in the class who had been "knocked out" at the shop the previous day while throwing a switch carelessly. The pictures were passed out for study, one to each boy. At a signal each passed his picture to the right, and studied the new one, passing until he received his original poster again. Then the right and wrong way to use a switchboard was discussed, and the class went into the adjoining corridor where the switchboard cabinet was unlocked and the right way demonstrated. Two or three boys were asked to repeat the demonstration, and then the class went back to the schoolroom, where they discussed the method of removing a victim from a live wire.

The instructor then asked, "If you were picked out to teach him, what would you tell a new boy about the use of the switchboard?" and listed the items on the board as they were suggested by the class. When a

usable outline was finished, there was oral sentence practice around the class, each boy giving one complete sentence about one item. After the new trade terms, like insulator, closed circuit, and non-conductor, were copied in their "trade term list" the boys were asked to write a paragraph, using the outline, and they turned in some excellent work. The lesson also left a good lead for a lesson the following week on resuscitation by the prone-pressure method.

Use of Posters and Test Sheets

The lesson on "lifting" was covered in practically the same fashion, the boys first studying the posters and then demonstrating the method by lifting a waste basket loaded with books. They built up a blackboard outline, practised oral sentences about each item, and ended with a "two-minute talk" by a volunteer. In both lessons the boys thought they were studying hygiene and safety. The teacher knew that they were being taught English. The part-time boy will talk and write about things that he really *knows:* Many an inarticulate fellow will get a start toward short speeches by standing to explain his poster, especially if he has on the board before him a little outline something like this:

The wrong things in this picture are.....

The right way is.....

This picture teaches us.....

Test sheets like those illustrated for these two lessons may be used to test the group quickly after the lesson is completed, for a brief oral review long afterward if review is advisable, or as an individual study guide for the boy who takes the lesson outside of the class.

Besides the use of demonstration, dramatization, and illustrative material, concrete teaching often means opportunity for experimentation. Suppose we want to teach the relation between gear teeth and gear speeds. We mesh a 40-tooth and a 20-tooth gear on a pegged board, mark their position with crayon, use our fingers for motive power, and count their respective revolutions. We mesh a 36 and a 72 and count again. Finally we mesh a pair having a different tooth ratio—1 to 3 or 1 to 4—and count once more. The average class does not need further demonstration before it discovers and states the relation for itself. We move the 20-40 pair to a second board with one intermediate pegged between them and count their revolutions; and repeat using two, three, and sometimes even four intermediates before the class is convinced that it can believe its eyes, then call attention to the direction of the motion of each gear and the part played by the idlers in changing its direction.

The "Oral Test Sheet—Gears," is passed out and at once brings to light for further demonstration any point not thoroughly understood, and we round out the lesson by adding to our notebook list the new trade terms: In mesh, idler, intermediate, simple gear train, driving gear, driven gear. This lesson has been given probably twenty times in approximately a half hour, and has never failed to reach each boy in the class. The

Oral Test
MACHINE SHOP SECTION
WAVERLY PART-TIME CLASSES
UNIT: LIFTING

Study the posters until you are sure of the following points:

RIGHT WAY TO LIFT:
1. We bend at the.....
2. We keep the back.....
3. We keep the feet.....
4. We keep the shoulders.....
5. The strain comes on the muscles of.....
6. If the object is too heavy we should.....

REMEMBER NOT TO
1. Not to bend at the.....
2. Not to let the strain come on.....

TWO INJURIES OFTEN CAUSED BY THE WRONG KIND OF LIFTING ARE:
1. .....
2. .....

PLEASE RETURN THE POSTER SET AS SOON AS YOU ARE DONE WITH IT.
THERE ARE ONLY TWO COPIES.

Oral Test
MACHINE SHOP SECTION
WAVERLY PART-TIME CLASSES
TEST UPON GEARS
DO NOT WRITE ON THIS PAPER
COPY THE STATEMENTS AND FILL BLANKS

1. Pulleys with teeth on their circumferences are called.....
2. When gear teeth interlock to transmit power we say they are in.....
3. If an 80-tooth meshes with a 40-tooth, the..... will turn more slowly.
4. The 40-tooth will make.....turn while the 80 turns once.
5. The 80 will make.....turn while the 40 turns once.
6. The tooth ratio of the 80 and the 40 is.....
7. The speed ratio of the 80 and the 40 is.....
8. The more teeth a gear has (other things being equal) the .....it will turn.
9. The fewer teeth a gear has the.....it will turn.
10. If a shaft making 55 R.P.M. and a shaft making 11 R.P.M. are turned by two meshing gears, the small gear is on the .....shaft.
11. If the small gear has 16 teeth, the large gear must have .....

GEAR TRAINS—TEST No. 1

1. When a line of gears turns in the same plane, we say they are meshed in a.....gear train.
2. The gears between the first and last are called..... or.....
3. They have.....effect on the comparative speeds of the first and last.
4. The idlers are used to.....
5. If the first gear turns to the right, the second turns to the.....and the third one turns to the.....
6. Every second gear turns.....

REMEMBER FORMULA
TEETH × TURNS = teeth × turns
(Capital letters) (small letters)
Big gear small gear

Oral Test
MACHINE SHOP SECTION
WAVERLY PART-TIME CLASSES
UNIT: SAFE USE OF SWITCHBOARD

IN USING A SWITCHBOARD:
1. Stand on.....
2. Use.....hand.
3. Put other hand.....
4. Look at.....
5. Treat all wire as if.....

IN CASE OF TROUBLE:
1. Remove victim from live wire by.....
2. Do not touch.....
3. Do not stand.....
4. Revive victim by using.....
5. Keep it up at least.....if recovery does not occur sooner.
6. .....voltages are dangerous.

"REMEMBER NOT TO TALK TO THE MAN AT THE SWITCH"
MIND YOUR OWN BUSINESS.

individual instruction sheet for the absentee follows the group lesson plan exactly, first telling him what to do, then giving him a blank form in which to record his findings, and finally referring him to the "Oral Test Sheet."

As a start for the next lesson the teacher puts on the board this form:

A 40 making.....turns = a 36 making.....turns.
A 36 making.....turns = a 24 making.....turns.
A 40 making.....turns = a 28 making.....turns.

We mesh the 20 and 40, or any other pair, again and show *why* one makes two revolutions while the other makes one, give the term "tooth transits," and then count revolutions again, one of the students recording our results in the blank spaces on the board. Then we compare the number of tooth transits for each pair of gears, and as a usual thing the class discovers for itself the formula which we usually abbreviate to

TEETH × TURNS = teeth × turns
(Capital letters) (small letters)
Big gear small gear

They are ready to think out practically any problem involving only simple gear trains and solve it by the use of the formula, because they have *discovered* the fundamental principles instead of memorizing them. We find the pegged boards more convenient than teaching directly from the machine, because the class has more chance to experiment, with less danger of pinched fingers. Our boards took only a few minutes to prepare, have been used by a dozen classes and a hundred individual students, and are good for a hundred more.

Simple Material Best

Material of this kind need not be elaborate—a sand-filled baking powder can and a paper cone with the same diameter and altitude will develop the comparative cubic contents of the two solids quite as easily as a more expensive equipment. Formulae as time savers are important to the shop man, and he frequently uses a formula which he could not develop and does not necessarily understand, but it pays to build up a few with the boys at the start. If he first understands how to find the cubic contents of a cylinder, the boy who fills his cone three times with the sand from the can has no difficulty in stating his own rule for the cone, and he does not "forget the formula." When you believe that your boys really understand the problems in areas of plane figures that they can solve from a textbook, try handing them good-sized triangles and trapezoids cut from newspaper, let them take their own measurements, and work out the areas. The results will likely surprise you.

For many reasons, but especially for assistance in drill and review, experience indicates that every part-time student should be required to keep a notebook. After considerable experimentation the writer is inclined to believe that one of the stiff-covered, loose-leaf, ring-binder variety for every student is the most satisfactory arrangement. The same book serves for all subjects, being easily divided into different sections by the occasional insertion of a colored sheet. Experience also indicates that they should be kept on file at the school between sessions. The instructor will find that a gummed parcel post label containing the student's name, attached to the upper right hand corner of one cover, is of considerable assistance in rapid filing and distributing of the notebooks. The only written work required for many a lesson will be copying of a co-operative outline built by the class. Weeks afterward that lesson may be reviewed in a spare minute before the bell by brief reference to the outline, which may form the basis of an oral paragraph. The boy who would make an absolute failure if called upon without the outline will often do a good piece of work if he has it to depend upon as a starter. Trade term lists, occasional definitions, formulas from shop mathematics, business letter forms, tool study and shop practice outlines accumulate as the year advances, and are tangible evidence for the student that he is really making progress.

Testing Mechanical Ability by the MacQuarrie Test

S. D. Horning, John Marshall Junior High School; Ruth S. Leonard, Educational Counselor, Pasadena, Calif.

Can Mechanical Ability be Pre-determined?

If a pre-determination of mechanical ability is possible would it not be an economical step in progress to assign to the mechanics classes only those whose ability along such lines has been proven rather than to enroll therein all the low I.Q.'s and misfits from the other departments? With this question in mind a study was made in one of the mechanics classes of the John Marshall Junior High School of Pasadena, California.

For this study 25 pupils were given: First, the Terman group test of mental ability, Form B; second, the MacQuarrie test for mechanical ability; and third, a rather complicated mechanical project in electrical construction. This project which involved several mechanical processes was the construction of an electric motor. (See illustration.)

These pupils were normal junior high school children of the following ages:

7 aged 12
11 aged 13
6 aged 14
1 aged 15

They had about the same training and all work was performed under the same conditions as far as they could be regulated by the school.

TABULATION OF SCORES

1 Number of Student	2 Mac-Quarrie Test	3 I. Q.	4 Rank of Project	5 Time	6 Accom-plish-ment	7 Semester Grade	8 Age
1	41	113	70	70	70	85	13
2	41	100	80	70	74	85	12
3	42	114	84	72	78	85	13
4	46	113	80	82	81	75	13
5	48	88	78	72	74	85	13
6	48	106	82	82	82	95	13
7	51	102	92	95	93	95	13
8	51	133	80	82	81	85	12
9	52	119	80	82	81	65	12
10	53	86	78	86	82	95	14
11	53	96	80	86	83	65	12
12	53	94	83	87	85	85	14
13	53	113	94	82	88	95	13
14	56	95	87	83	85	85	14
15	56	112	84	94	89	85	12
16	57	115	86	90	88	85	13
17	58	93	84	90	87	85	14
18	59	106	84	82	83	85	14
19	60	111	83	75	79	85	12
20	60	110	82	86	84	85	13
21	62	83	82	92	87	85	15
22	62	94	91	91	91	85	14
23	65	134	92	84	93	95	12
24	70	129	84	100	93	85	13
25	73	113	86	92	89	85	13

Column No. 1 is the pupil number given in the order of his score in the MacQuarrie test for mechanical ability. This order is used because the MacQuarrie test is the basis of comparison in this article.

Column No. 2 is the rank order of the MacQuarrie test for mechanical ability. Thirty-six was the lowest score a pupil received and 73 the highest.

Column No. 3 expresses the mental ability as measured by the Terman group test of mental ability, Form B, in terms of intelligence quotient.

Column No. 4 shows the rank of the project. This was determined after all the projects were completed. Each finished project was judged by two instructors and arranged in the rank order of excellence. This procedure was difficult because of the large number of parts to be judged. A score card became necessary.

SCORE CARD

MOTOR NUMBER.....

.....

Operations	Perfect Score	Score
Castings	10	.....
Bearings	10	.....
Field Coil Windings	15	.....
Armature Winding	15	.....
Commutator	15	.....
General Assembly	20	.....
Paint	15	.....

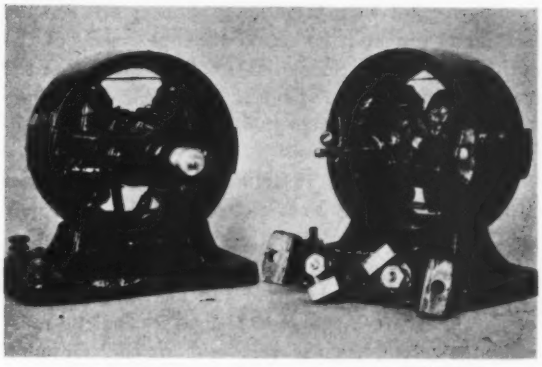
The specific results as indicated by the correlations are as follows:

Correlation between MacQuarrie Test and I.Q..... .02
Correlation between MacQuarrie Test Accomplishment .79
Correlation between MacQuarrie Test Project..... .66
Correlation between MacQuarrie Time..... .72
Correlation between Project and Test Time..... .68

Scientific knowledge in electrical operation was not taken into consideration. The results of this method of project ranking seems to have a greater degree of reliability because all projects were judged by comparison and the personal element of the grader was minimumized. (Each project was labeled by number so as to eliminate personalities.)

Column No. 5 gives the time element in terms of per cent. The time in periods was spread in terms of per cent over a grading scale of from 70 to 100. The project completed in the shortest time received the highest score or 100. The project requiring the greatest number of periods for completion received the lowest score or 70. This range of score was used because the method of scoring of this city ranks the lowest passing grade as 70 and the highest as 100. Time was taken into consideration because of its importance both in mental ability and in the MacQuarrie tests. It should also be remembered that the time element is a very large factor in the mechanical trades.

Column No. 6 shows the accomplishment and may be considered the sum total of the individual's efforts. It is determined by dividing the sum of the rank and time by two. This gives time a value of fifty per cent. Whether or not this is a correct weight can only be determined by a large number of experiments. It is not a question of the weight time ought to have but what weight it carries in the MacQuarrie test. This may raise the question, too, of how much weight should be given the time element in grading the individual but that is beyond this problem.



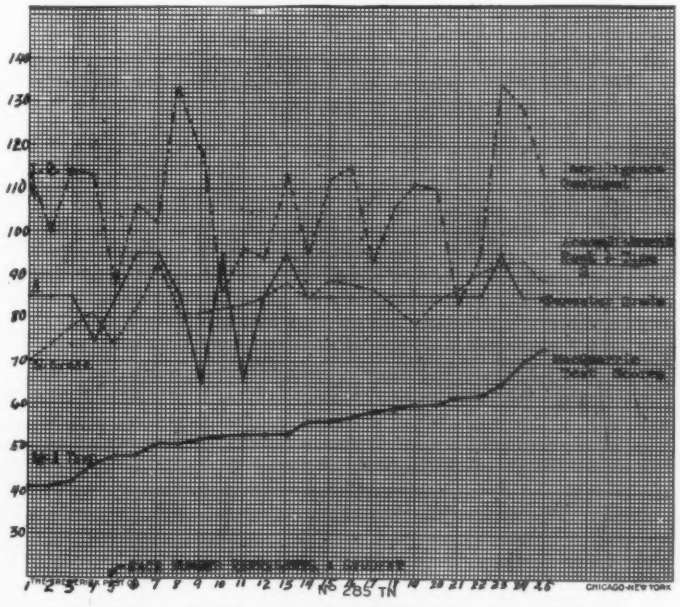
THE MOTORS WHICH WERE USED IN THE TEST.

Column No. 7 shows the semester grade or the final average grade given the pupil for the term.

Column No. 8 shows the chronological age.

Observations and Conclusions

There is little correlation between mental ability as measured by the Terman group test of mental ability and mechanical ability as measured by the MacQuarrie test for mechanical ability. Sometimes we hear the comment from teachers of mechanic arts that it seems that all those boys of low I.Q. are sent to the mechanic arts classes. Based upon the findings of this study, we must consider the possibility of giving a test for mechanical ability to determine registration in this department. If there is a correlation of .02 between mental and mechanical ability, many educational counselors have been mistaken in the theory that a dull pupil should do better work in mechanical subjects than in academic work. Giving a test for mechanical ability may be the means of economizing both in pupil cost and pupil time.



RELATION OF INTELLIGENCE QUOTIENTS ETC., TO SCORES IN MECHANICAL TESTS.

The above graph was plotted from the table. The student number is plotted horizontally and the scores are plotted vertically.

The highest correlation (.79) is that between the MacQuarrie test and the actual accomplishment of the pupil. Such a high correlation would indicate that the MacQuarrie test for mechanical ability measures those qualities which instructors in mechanic arts deem necessary for the trades.

The correlation of .72 between the MacQuarrie test and the time necessary for the completion of the project might have been expected. A survey of the mechanical field will show how important a factor is that of time for those who are engaged in the mechanical trades. Not only must one know how to produce, but he must be able to accomplish the maximum in the minimum amount of time. Industry pays for efficient accomplishment. It is true that the habits of accuracy should be emphasized in the school shop, but should the habit of speeding up be left for development on the job?

A fairly high correlation (.66) between the MacQuarrie test and the scores given in ranking the project, is shown. If a test of mechanical ability were given at the beginning of the semester and the results given to the instructor, these results could be used as a basis for determining what the pupil should accomplish and for removing his specific difficulties.

The correlation of .68 between the time necessary for the completion of the project and the rank of the finished project would indicate that the faster worker is the better worker. The old-time adage "slow but sure" may not apply to manual arts any more than to silent reading, where Judd and Buswell have shown by experiment that the faster reader is the more comprehensive reader.[1]

The semester grades which are based on the judgment of the individual instructor and in which the personal element may enter to a large degree are unreliable. A system of standardized tests, grading levels, and accomplishment charts will do much to eliminate the element of unreliability.

[1]Judd and Buswell, "Silent Reading," University of Chicago Press.

The Degree of Bachelor of Practical Mechanics

Laurence Parker, Ptttsburg, Kans.

Now that the summer is over it is a good time in the light of the past few months of experience to make plans for spending next summer and the summer after that.

"Where would you advise me to go to school next summer? What courses should I take?" These questions were asked many times last spring by manual training teachers who had ambition to improve themselves professionally. The answers that I gave were all along the same line. Do you need additional study in order to get your degree in Education? If not, enroll for the summer in "The University of Every-day Life." Hire out and work at some trade or occupation which will increase your contact with the life that your students will have to live after they leave school. Work for the degree of B. P. M.—"Bachelor of Practical Mechanics."

When we visit a manual training teacher in his shop we imagine that we can note the difference if he is enrolled in the University of Every-day Life for the degree of B. P. M. We may be fooled sometimes but almost invariably the boys under such a teacher are using more initiative, are pushing the completion of their work more vigorously, than are the pupils of the manual training teacher who has not had practical experience.

A teacher of drawing in a Kansas High School had his Bachelor of Science degree. He was planning on spending the summer upon work toward a master's degree. He had never worked for a single hour in a commercial drafting room and yet he seemed surprised when we suggested that it would pay him to secure work in a first class commercial drafting room, even if he had to pay for the privilege. We advised him to work for the degree of B. P. M., because it would be impressed upon his mind long before the summer was over that quantity of output was necessary as well as quality. He would not be in the embarrassing position of the college teacher of drafting we once visited who was attempting to train men vocationally as draftsmen. He had not been in a commercial drafting room in five years and did not know of the substitution of drafting paper for tracing cloth in many establishments.

The teacher of auto mechanics who does not spend summers in service stations or automobile factories loses much in the way of preparation for successfully teaching his trade. Models change so rapidly and service methods improve so fast that he cannot afford to lose contact with the industry.

The sheet metal instructor who has never had actual experience in the factory making up blower systems and getting out and installing them in the mills has missed a great deal of experience which will come in handy in his sheet metal instruction.

The teacher of cabinet making can well afford to pay for the privilege of a summer at odd jobs in a furniture factory where he has the opportunity to keep his eyes open for good and bad points of furniture construction.

Solid wood construction in the cabinet shop of the high school has its many disadvantages. These tempt the instructor to use veneer as a substitute. Perhaps he only knows veneering in a theoretical way. He might get the instruction which he needs in the summer course at a teachers' college, but he would learn many practical points in the use of veneer while working in the furniture factory.

Good design in furniture is very much like "tact" as the Pullman porter defined it. "Tact," said he, "is

some thing if you hasn't got it everybody notices it and if you has got it nobody pays any attention." A poorly designed piece of furniture is noticed by the very people that you want to impress with your ability. Lucky indeed is the instructor who can spend the summer in the designing room of a special order furniture factory, and learn in a practical way the principles of good design.

We recently visited a large manual training shop. A boy appeared before the instructor with the partial assemblies of a chifforobe. Under the instructor's watchful eye he assembled it. Then the two of them walked all around the work and inspected it critically. There was something about the way they worked together which reminded us of men in the model department of a factory. This caused us to inquire as to the practical experience of this instructor. He had spent a number of years in a furniture factory. He had the degree of Bachelor of Practical Mechanics.

If I were helping to make a product I would want to see, as a matter of interest if nothing more, the conditions under which this product was to be used. If I were a manual training teacher working with boys who must go out into the world and make a living, I should want to know as much as possible about this world of theirs and its industries which are to receive them. If I were a manual training teacher and really enjoyed using the tools of the trade I would appreciate the chance to use those tools, out in industry, earning the degree of B. P. M.

Perhaps now that your summer work is over, wherever it was spent, you will agree with me that from now on you should plan. If you start making your plans right now you should be able to land the chance you are looking for.

Here is hoping that you will give the "University of Every-day Life" a chance to enroll you for its summer courses next year. Application should be made as far in advance as possible in order that you may select just the courses you need toward the degree of B. P. M.-

"Wanted: Parking Space"

J. Douglas Wilson, South Pasadena, Calif.

"O! for an umbrella to cover my flivver!"

"I left mine home this morning; too rainy."

"I usually leave mine home every day as I don't like to leave it in the sun or rain all day long."

"I rent a garage near here, but it costs $3.50 per month."

These and other kindred statements were frequently heard from faculty members of the Roosevelt high school in Los Angeles. How to protect the car during the school day was a problem—and is in many schools. This article is written to show how this school solved the problem.

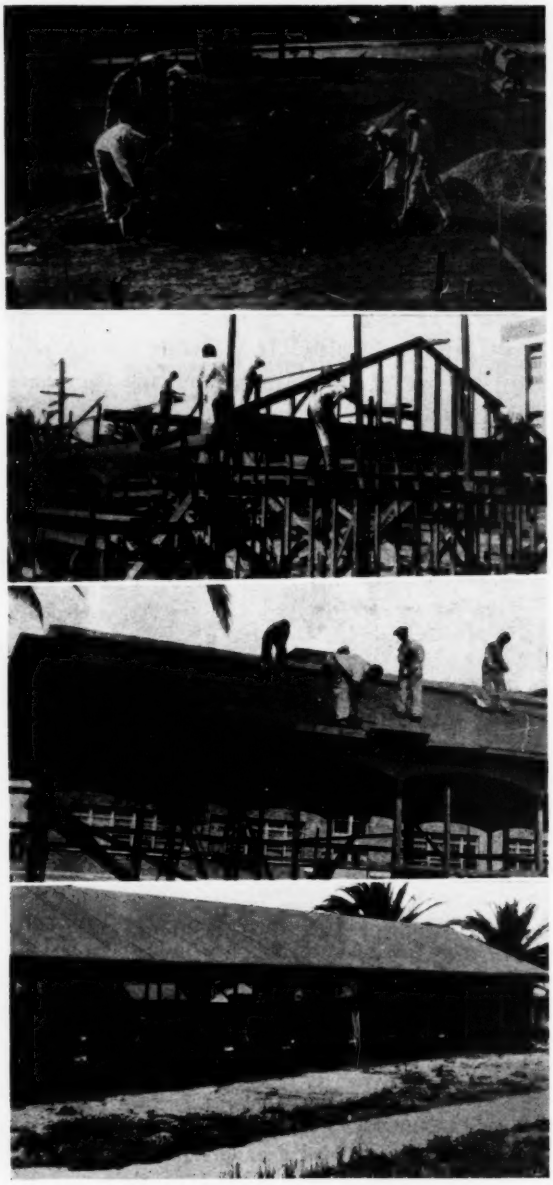
One instructor asked: "Why not a faculty garage? $3.50 per month for a private garage is $35 per year and then the garage is not very near the school. Would some of the teachers be interested in financing a garage large enough to house several cars?"

The problem was put up to the Smith-Hughes carpentry class to solve. The carpentry instructor conferred with the principal who gave his approval immediately and said that there was a piece of ground available that might be utilized.

Tentative plans were drawn and submitted to the faculty at one of their regular meetings. The size of the ground made it necessary to limit the capacity of the proposed garage to twenty cars. The outside dimensions of the building were 28′x80′, the width of each stall being approximately eight feet.

The total cost was estimated at $500 or $25 per stall. When this fact was announced and that the first twenty signing would be given first option, there was

THE COMPLETED GARAGE, SHOWING THE VOCATIONAL CARPENTRY CLASS.



PROGRESS PICTURES OF THE GARAGE.

a quick response and in a short time 24 teachers had signed, signifying their desire to participate in a community garage project.

With the information in hand that the project would be financed, the plans were completed and blueprints made by two special drawing students in the carpentry class. These plans were then submitted to the board of education and the building department of the city of Los Angeles for their approval.

Next the carpentry class boys figured out the material bills. These included cement, sand, rock, gravel, framing lumber, outside finish lumber, roofing paper, paint and hardware. Incidentally, this was excellent experience in practical mathematics pertaining to carpentry.

Competitive bids were secured from the local dealers. The lowest bid, which was accepted, came to a total of $520, or a per capita cost of $26.

Actual construction work was started on the 15th of Februrary and the garage was completed in six school weeks of five 3-hour days each. A total of approximately 1000 "student hours" of work was done. This of course, was instructional time and not entirely devoted to construction work.

The constructional work was of a varied nature. The transit was used to lay out the building and also to determine the length of the 33 posts, each of which are of a different length due to the slope of the ground. A sufficient number of pier boxes were made to cast one-half of the number of piers required and then were reset to their second position. Steel dowels were placed in the center of each concrete pier to hold the bottom end of the post to its place.

A power mixer was used to mix the concrete, the fifteen boys in the class really enjoying this part of the work.

The building required 86 rafters of 2″x6″ stock, 18′ long. Each boy laid out one rafter by the use of the steel square. The marking, however, for all of the rafters was done from a master pattern. This method of instruction gave each boy the experience of rafter layout work and yet made all of the rafters exactly the same shape and size.

To give the building an artistic touch and make it "harmonize" with the main school plant, arches were constructed over each stall. The radius for the arch was determined by measuring a similar arch on a long colonnade between two of the buildings.

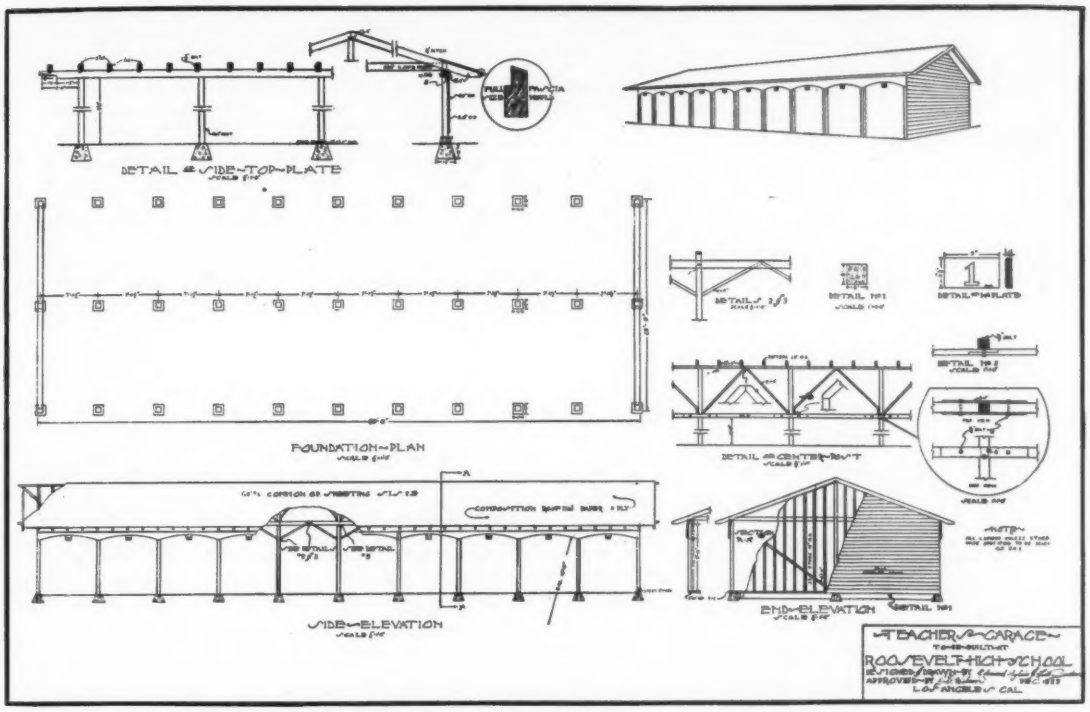
A red composition roofing was selected, to blend in color with the brick work on other buildings near and to make a pleasing contrast with the side walls of the garage which were painted buff.

An exceptionally neat appearing roof was secured because the distance from eaves line to eaves line, in the "slant" of the roof is a little less than the full length of a roll of roofing paper. Consequently there are no end laps in the finished roof. Thirty rolls of paper were used on the roof and 3,500 square feet of 1″x6″ sheathing stock. This stock was sized to an even width so that the cracks between each board are tight.

The two ends of the garage were enclosed with ⅝″x6″ beveled siding, 1,000 board feet being required. Both ends, the arches, posts, and cornice were given three coats of paint by the carpentry students. This gave the boys a general idea of the handling of a paint brush, the spreading of paint, and a knowledge of the ingredients in it.

Each stall was numbered with a brass number which was placed in the center of the arch.

All concerned are very well pleased with the outcome of the project, both from a financial standpoint and from the final appearance and construction of the garage. The completed garage is worth at least $1,000,



DETAILS OF THE TEACHERS' GARAGE BUILT AT ROOSEVELT HIGH SCHOOL, LOS ANGELES, CALIF.

is very conveniently located and the financial outlay, per teacher, a very small one. The only additional cost will be the renewal of the fire insurance policy and an occasional coat of paint. It also made an excellent carpentry project where speed was emphasized to some extent, there being enough of each kind of work to give each boy sufficient practice for him to do his part of it efficiently.

Instruction Sheets in a Machine Shop Course

E. H. Kreider, Thaddeus Stevens Industrial School, Lancaster, Pa.

The machine shop course in the Thaddeus Stevens Industrial School has been developed on the basis of an analysis of the trade, and of the accepted objectives of a vocational shop course. It has been broken up into definite units, which the students take in the shape of projects arranged in instruction and job sheets. A few of the projects are necessarily intended for instructional purposes only, but the great majority are so designed that when completed, they become standard parts of machines or tools, and are stored in the stockroom until needed in assembling.

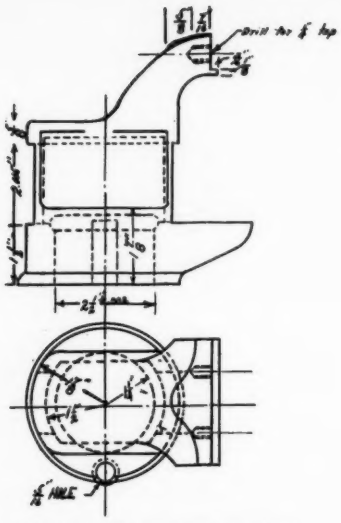
The projects reach the student in blue print form, each sheet measuring 10" by 14". Each contains a detail drawing of the piece to be made and written directions for the sequent operations. In separate columns the necessary tools are listed, and much related information is given.

The accompanying sheets illustrate three typical jobs. The welding project is one of the few intended purely for instructional ends. The illustrations show how the work is to be held in the vise while upsetting, where the bar is to be turned and threaded. It is made clear in the directions that the bar is to be placed in a pulling fixture attached to a forcing press. The student cannot fail to understand the importance of a good weld, because the bar must tear at the neck—not at the weld—to receive the instructor's approval.

The project 10B involves not only the immediate instructional value of several important operations, but it must be made accurately as required in the drawing, so that it may be assembled with other parts as a swivel bench vise body. The project on bevel gears, 16C, involves some intricate calculations and advanced work in forming a blank and cutting teeth of miter gears. Commercial standards of accuracy are emphasized.

To make sure that every student has ample opportunity to work out the thirty units which form the basis of the course, and which involve all the basic operations in bench work and machine tool work, two simple devices are used. Each boy is supplied with daily time slips upon which he records the kind and time of the jobs which he works upon (Fig. 1). These time slips are checked daily by the instructor upon a tally chart (Fig. 2) which reveals the time consumed by each boy upon each of the jobs. The tally sheet presents an accurate picture of the progress made by each boy and by the class as a whole; it reveals the individual efficiency of each boy in performing the several jobs, and it serves as a permanent record and as a means of comparing class with class.

The course is not so rigid that special jobs in which boys may be interested, jobs for the school or community, or repair work cannot be admitted. These are, in fact, frequent and are welcomed because of the interest which they arouse and the opportunity which they present



DETAILS OF FACE PLATE AND ANGLE PLATE WORK

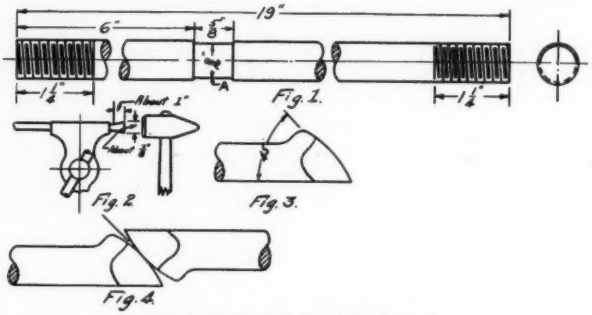
FACE PLATE AND ANGLE PLATE WORK (10B)

Angle plates bolted to face plates make very useful fixtures for various machine jobs. They are usually planed to an angle of 90° between the finished faces, but may have any desired angle. These angle plates are provided with the necessary holes, grooves, or slots, which will adapt them to a large variety of jobs in face plate work. The job involved in this exercise is provided with a V-grooved angle plate that when once set it is not disturbed and duplicate pieces may be quickly and accurately located and machined.

This angle plate being considerably off center with its heavy projecting arm will require a counter balance weight. This may be any piece of cast iron or steel that has a hole in it for convenience in bolting to the face plate.

Caution—Be sure that both the shoulders on the spindle and face of the hub of the plate are free from burrs and that both threads are clean—then the plate will screw freely on the spindle all the way up to the shoulder. Don't screw the plate against the shoulder with a bang. You may have much trouble to remove it if you do. Much care must be exercised in machining a piece of work that is bolted to a face plate, that you do not cut into the plate. Especially in boring a hole with a boring tool, one is likely to cut into the plate.

Project	Tools
Face bottom and bore one vise body as shown.	
Sequent Operations	
1. Lay face plate on bench with angle plate laying on paper approximately in position with work bolted in V-block.	Face Plate Angle Plate Clamps and Bolts
2. Bolt angle plate to face plate and screw same on lathe-spindle.	
3. Test for central chucking by bringing lathe tool up close to cylindrical body of work, shift angle plate (if not central) and repeat until true and central.	Test Tool
4. If angle plate has not been disturbed since last used for this exercise, the above may be omitted.	
5. Face end until the dimension of 1⅞" is correct.	Roughing Finishing Tools
6. Bore base opening to fit 2½" standard.	Boring Tool
7. Chamfer corner at entrance of hole.	Diamond Point Tool
8. Turn outside diameter of base bead. (See dimension.)	Rounding Tool
CI.....14C ESTIMATE HRS.	



DETAILS OF WELDING PROJECT.

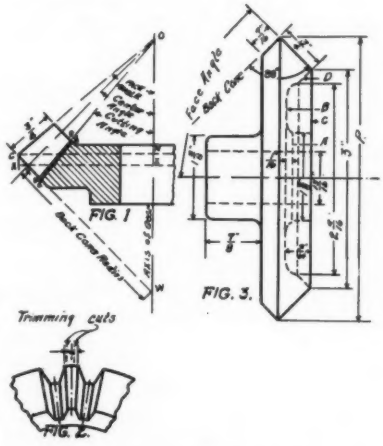
WELDING (26A)

(Project)	Tools
Welds are classified according to the way the ends are formed prior to making the weld. The different welds ordinarily made in hand-forging are the scarf-weld, butt-weld, lap-weld, cleff or split-weld, and jump-weld. It will be seen that the surfaces to be welded are crowned. This is done so that when the heated ends are brought together they will unite first in the center. Any slag or dirt which may have adhered to the heated surfaces will then be forced out as the welding proceeds from the center outward.	
When two pieces of iron or steel are heated until they become soft and plastic and will stick together when one is hammered against the other, they have reached the welding heat. If the work remains in the fire too long, it becomes overheated and burned, which greatly injures the metal. Iron which has been overheated has a rough, spongy appearance and is	

Project	Tools
Make one "Scarf Weld" so it will withstand the tensile strain of tearing apart at "A," Fig. 1.	
Sequent Operations	
1. Saw two pieces Bessemer rod ⅝" dia. about 30" long.	Hacksaw Forge Vise Hammer
2. Heat both rods at one end. Shut off blast and swell or "upset" end of rods by holding firmly in vise and applying rapid blows with rather a light hammer. See Fig. 2.	
3. Re-heat same ends and scarf as at Fig. 3.	Hammer
4. Heat the prepared ends for welding, by observing closely the following: Have a good heavy bed of coals. Heat slowly. Both pieces must be at a welding heat (almost white) at the same time. Keep face of scarfs downward while heating. Take both pieces (quickly) to the anvil, landing the ends on same with a blow with scarfs downward. Turn one piece over and set	

brittle. The danger of burning is increased when the air blast is too strong and the fire is oxidizing. When heated iron comes into contact with the air it absorbs oxygen, thus forming a scale or oxide of iron on the surface, which prevents the formation of a good weld. The surface being heated may be protected somewhat by the use of a flux which will exclude the air. A common flux for this class of welding is sand or borax.

Coke, coal, charcoal, oil, and gas are used as fuels for heating iron and steel preparatory to forging or welding. For general work a coke fire is the best, although bituminous coal is extensively used. Sulphur, lead, or brass must not be in the fire to be used for heating iron or steel.



DETAILS OF BEVEL GEARS.

BEVEL GEARS

(16C)

In making bevel gears, we must first decide upon the pitch and ratio required. The pitch is governed by the load required. The ratio by the speed. The outside diameter, the face-angle, the cutting-angle, etc., may be obtained fairly closely with a scale and protractor, from a good drawing. They may be obtained also from tables of gear-tooth parts in hand-books, etc. The load or pressure on the teeth of the gears required in this exercise is approximately 80 pounds and the velocity on the pitch line is 600 feet per minute. The ratio is even, that is, the gears will be equal in size and shape. They are called "Miter Gears." We find from the hand-book tables that 10 pitch ¾" face gear with a velocity of 600 feet per minute will carry the load of 80 pounds. On this basis we will make the gear as shown at Fig. 3.

INDUSTRIAL SCHOOL

Student Chas. L. Gray

Date Apr. 1 192 6

8:00	1:00
8:15	1:15
8:30	1:30
8:45	1:45
9:00	2:00
9:15	2:15
9:30	2:30
9:45	2:45
10:00	3:00
10:15	3:15
10:30	3:30
10:45	3:45
11:00	4:00
11:15	4:15
11:30	4:30
11:45	4:45
12:00	5:00

STUDENT'S DAILY TIME CARD.

scarfed ends together (Fig. 4) and with a few sharp blows of the hammer make them stick. Then close up the ends as quickly as possible. Re-heat (welding heat) if work becomes too cold to complete the weld on the first heat.

5. File the scale off the weld, and finish with top and bottom swages. — Bastard File
6. Saw the 19" length out of the bar so as to leave the weld in the center of the same. — Hacksaw
7. Cut threads on ends with ⅝" No. 11 die. — Die
8. Turn neck "A," Fig. 1, as shown. — Lathe
9. Test for tensile strength. If it tears at "A," O. K. If not, repeat the welding. — Forcing Press

Project — **Tools**

Make one miter gear complete 10P-40 teeth.

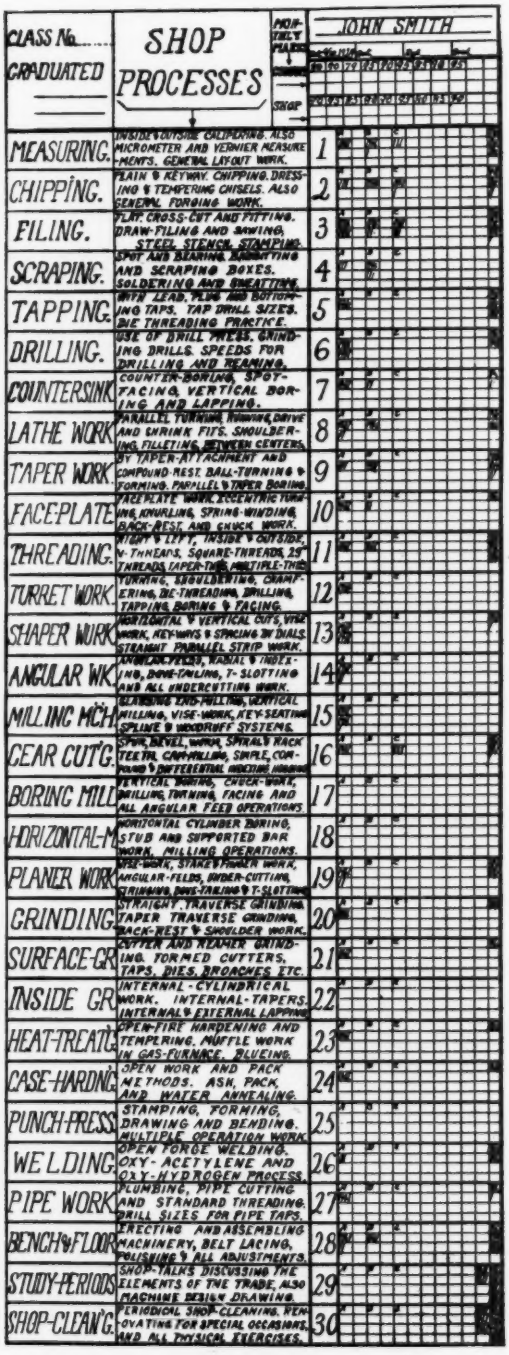
Sequent Operations

1. Chuck blank on hub. Rough-turn A-B-C. Spot and drill 1¹³⁄₆₄" hole. Bore within .010 of size. Then ream to size. Finish turning A-B-C. — Round Nose Tool; Spotting Tool
2. Press arbor in blank from machined side. Put same between centers of lathe.
3. See Bevel Gears in Am. Machinist Hand-Book for table of dimensions. — 1¹³⁄₆₄" Drill
4. Turn outside diameter first, then turn face-angle until face of gear measures ¾". — Boring Tool
5. Turn back-cone 90° from pitch angle, and turn "D" parallel to same.
6. Rough and finish remaining surfaces. The blank is now ready for milling.
7. Mount the blank on special arbor which fits "Index Head" of milling machine. — 1⅜" Reamer
8. Select cutter required by measuring back-cone-radius and referring to Am. Mach. Hand-Book, page 123. — 1⅜" Arbor
9. Set work central with cutter and set crossfeed dial at zero. Set index head to cutting angle. — Hand-book
10. The depth of cut should be the same as for spur gears of the same pitch. — Diamond Point Tool
11. Take central cut around the gear. Mark (with chalk) the last cut made.
12. As these teeth are much too thick at the outer ends, they must be trimmed. See Fig. 2. — Index Arbor
13. Set the work out of center (in either direction) which for best results may be approximately ⅛ of the thickness of the (over-size) tooth on the pitch line at large end. We are not yet ready to cut, but you must roll the work as follows: — Milling Cutter
14. Through the index worm, rotate (or roll) the work-blank back toward the cutter until the cutter just passes through at the small end of the teeth. This will trim one side.
15. Take this cut off two or three teeth, then set work back to central position and to the opposite side the same amount as for the first side. Roll as follows: — Gear-tooth Caliper
16. Again through the index worm, roll the work back to central position, plus the amount of the first roll, and feed into work carefully. If you have made no errors, the cutter should again just enter at the small end of tooth, then trim these few trial teeth on this setting. This should complete these trial teeth.
17. With gear-tooth caliper measure thickness of tooth on the pitch line.
18. If tooth is too thick, the set-over was not enough and must be increased accordingly, and trimming cuts repeated on these few teeth until they measure correctly.
19. When the proper thickness of tooth has been obtained by these trial cuts, take the trimming cuts. First, the one all the way around the blank, then the other.

CI. .....L.O. ESTIMATE HRS.

for independent thinking in the solution of original problems. Boys who engage in special work are given credit for it, and record is kept by the instructor, in a special sketching pad, of the job, the machinery used, the tools required, and the operations in sequence, etc. A duplicate copy of this record serves as the student's job instruction sheet, so that he may have all the instructional benefits which he would derive from a standard job.

The plan just described has been successful and has resulted in rapid progress by the students.



SECTION OF THE RECORD SHEET USED BY THE AUTHOR.

OBJECTIVES OF INDUSTRIAL ARTS

"Tradition and folk-ways have been rapidly displaced by science, mathematics and mechanics in trade and commerce, manufacture, agriculture, transportation and communication. An insistent demand has been made upon the school that the boys and girls be given something besides abstractions and verbalizations."

So writes Clarence E. Johnson in School and Society in a discussion on the objectives of industrial arts in school work. He summarizes these objectives as follows:

"(1) To give a knowledge and scientific appreciation of one's commonplace environment.

"(2) To offer a fertile field for the creative impulses, prepotent in youth.

"(3) To develop habits of concrete, specific thinking and habits of thoroughness, honesty and responsibility in meeting a variety of life problem situations.

"(4) To develop mechanical insights and manual skills, a common and growing need in the activities of life. 'Ability to perform unspecialized activities about the house, basement, garage, yard, garden, motor car, etc.'

"(5) To furnish a prevocational background.

"(6) To appraise other valuable human qualities needed for success besides the ideational and to strengthen them.

"(7) A proportional intellectual apprehension of the world of productive industry; of the specialized occupational groups which compose it; and of tools, machines, raw materials, processes, products, etc., involved. Ability to think in terms of the realities.

"(8) A disposition and habit of being up and doing, independent, active and positive in one's home life and one's affairs in general; not dependent upon others, passive and negative.

"(9) A disposition and habit of holding one's practical labors to reasonably high standards of performance; of always doing one's best. Dislike of things careless, faulty, incomplete, etc."

ART EDUCATION MADE PURPOSEFUL

The state of Pennsylvania has held particular distinction in the arts. Her early builders, painters, sculptors, and master craftsmen have set enviable standards of beauty and skill, and from the fireside and the modest shop have come fine examples of the textile art, of pottery and glass, of furniture and metal crafts.

The practical purpose of art education in the schools of the state, as it has been carried out under the direction of Mr. C. Valentine Kirby, director of art instruction, is noted in the following aims:

First—To bring into the lives of the boys and girls everywhere the knowledge of beauty, the joy of expressing it, the development of skills; and the discovery of special aptitudes and talents.

Second—To direct those with special inclinations and gifts into various fields where signers, decorators and professional artists are required.

Third—To train specialists in art education to meet the great demands in our elementary, secondary, and normal schools for teachers and supervisors of art.

Fourth—To cooperate with educational and other welfare agencies in the state in furthering by means of pupils' drawings and industrial arts the general school studies; and by poster-making to advertise health education, conservation of forests, fire and accident prevention.

Fifth—To provide more attractive school buildings and grounds and a recognition and regard for the finer things in the home, the school, the shop and in life generally.

Accident Prevention in School Shops

James K. Shallenberger, Brighton, Colo.

(Fifth Article)

THE MILLER

1. Have you read the catalog description?
2. For what type of work is this machine designed?
3. How is the machine started and stopped?
4. Where is it oiled? The miller needs frequent oiling at the cutter head bearings.
5. What is the capacity of the machine?
6. What are the abuses of the machine and to the stock?

a. Attempting to force the machine by too heavy cut. If the machine slows down, the feed gear should be thrown out until it has picked up speed. If throwing in the feed gear again slows down the speed before a fair advance in the cut has been made, some reduction in the cut will have to be made.

b. Feeding the stock to the cutter before the machine has picked up speed.

c. Allowing short stock to feed through and drop on the floor where it may pile up and jamb against subsequent pieces coming through. Pieces three or four feet long frequently do this by falling, one end on the floor, one end remaining propped against the table.

7. What is the maximum cut allowable? The answer should bring out that the depth of cut is inversely proportional to the width of the stock. A quarter inch cut might be allowable on a piece of pine 4"x4", while 1/32" might be a maximum for an oak table top.
8. How is the machine adjusted for the first cut?
9. How is the depth of cut regulated? Before answering the student should have acquainted himself with the gauge, its zero point, and the change that is made by a full turn of the control screw.
10. How is the feed operated?
11. What is the procedure when milling several boards to the same thickness?

Pick the board which is thinnest in the rough. Set the machine to a heavy cut and run all stock through without changing cut. These should be run in tandem, never two at a time, unless the stock is of such uniform thickness that the feed roller catches each board securely. After the stock is reduced to a uniform thickness, boards may be turned over and surfaced, but the series should be run through without changing the depth of the cut.

12. What are the dangers to the operator of this machine?

a. Stooping down to sight depth of cut while holding in a board to test. The cutter frequently catches the board and whips it out like an arrow. More than one broken nose has resulted from this.

b. Running through stock of different thickness two boards at time unless feed roller catches both. Dangerous results are the same as in *a*.

c. Walking backward away from the machine while pulling through stock if there are any belts, line shafts or the like which may be backed into.

13. Demonstrate.

Set first the cut of the machine and run through two boards of different thicknesses. Surface the two sides to a required thickness, though no great precision should be asked.

THE JOINTER

1. Have you read the catalog description?
2. For what type of work is this machine designed?
3. How is the machine started and stopped?
4. Where is the machine oiled?
5. What are the abuses of this machine?

a. Attempting to adjust the fence while the machine is running.

b. Laying tools on the table which may be pushed into the cutter.

6. What is a square head cutter; a safety head cutter?
7. How is the depth of the cut regulated?
8. How is the rear table adjusted?
9. How is the front table adjusted?
10. What are dangers in using the machine?

a. Jointing pieces too thin so that they may break and fly back at operator. When it is desired to joint very thin strips that bend away from the cutter, a shoe made of a piece of 2"x4" may be used to hold down the strip while it is pulled through.

b. Jointing pieces too short so that the heel of the stock may drop into the cutter head and the fingers along with it.

c. Feeding stock to machine before the cutter has picked up speed. The result of this may be that the cutter will throw the stock back against the operator with dangerous force instead of cutting.

d. Allowing stock to come in contact with cutter before the stock is firmly on table. The results of this may be the same as in *c*.

e. Allowing hand to pass over cutter when the piece is too thin to give ample clearance for the fingers. This is the chief source of accidents on the jointer, and one way to make it clear to the student is to frequently refer to the machine as "the finger trimmer."

f. Jointing stock with the fence at an angle. This makes it possible for the stock to slip away from the fence and allow the hand to drop into the cutter, unless care be taken to exert a side pressure against the fence as well as a down pressure against the table.

11. Demonstrate.

Ask the student to joint the edges of a 1"x4"x16" piece of stock, square on one edge and beveled on the other.

THE JIG SAW

1. Have you read the catalog description?
2. For what type of work is it designed?
3. How is the machine started and stopped?
4. Where is it oiled?
5. What precautions should be taken before starting the machine?

a. See that the guide is just high enough to clear the stock.

b. See that the table is clear of scraps and tools.

c. See that the foot lever is turned down ready to use.

6. What are the abuses of this machine?

a. Nails in stock.

b. Forcing the saw to do too fast a cut.

7. What should be done before shutting off the power?

Throw the saw out of gear.

8. What are the dangers in using this machine?

a. Using the machine with the guide too high. This machine more than any other offers the danger of chattering stock, which always imperils the hands of the operator if the work gets out of his control. A low guide is considerable protection against this.

b. If the operator attempts to walk around the machine while operating it, he may walk into a belt-drive while watching the cut of the saw.

c. If the drive rod below the table is open, aprons should be tied close to the body or discarded while operating machine.

d. Attempting to reach too far round on the table, thus bringing the head in contact with the saw or tension head.

e. Attempting to adjust the height of the guide or tilt table while the saw is running. If the saw is stopped in the cut, it should not be started in any place that is likely to bind, and so lift up the board from the table.

f. Using a dull or poorly set saw so that the work chatters on the table. This may cause the saw to catch, to tilt the stock and throw the hand into the saw.

g. Attempting to use the saw where the cut runs out into narrow stock. The greatest care is necessary here because, if the work chatters, the finger may be ripped open.

h. Sawing under cut or round pieces that are likely to roll.

9. Demonstrate.

Use a scrap with a sharply curved line so that the student may be watched making a turn. Have him stop and start the saw somewhere in the cut.

THE CIRCULAR SAW

This set of questions is divided into three parts because the three operations are widely divergent in many respects. The first questions apply to all operations. They are based on the "Universal" type common in manual training shops.

1. Have you read the catalog description?
2. For what type of work is the machine designed?
3. How is the machine started and stopped?
4. Where is the machine oiled?
5. What precautions should be taken before starting the machine?

a. See that the saw is no higher than necessary to make the cut.

b. See that the fence and guard are clamped tight.

c. See that the table is clear of tools.

d. The saw is not to be started simultaneously with a jointer or miller. The necessity for this precaution depends upon the size of fuses used in the power circuit. All three machines draw heavy starting current and fuses may be blown if they are started at the same time.

6. How is the saw changed from "cross cut" to "rip" saw?
7. When the stock is too thick for the saw, what is the procedure?

The lumber must be reversed in a certain way to bring the new kerf in line with the old. The saw being hidden makes the operation dangerous if care is not taken to watch the position of the hands.

The Machine as a Rip Saw

1. How is the machine adjusted for ripping?

The answer should show knowledge of regulating the depth of cut, adjustment of fence, and difference between a cross cut and a rip saw.

2. How is the guard adjusted?
3. Under what circumstances should you use the saw without the guard?

Never without permission of the instructor?

4. What is the minimum cut allowable between saw and fence?
5. What are the abuses of this machine?

a. Nails in stock.

b. Anything that will tend to bend or warp the saw. This includes such things as pushing in stock when space between saw and fence is fouled with blocks; pulling through a board without being careful to keep the stock in line with the saw.

c. Attempting to handle alone stock too heavy or too long to be kept under control by the operator.

6. What are the dangers of this machine as a rip saw?

a. Ripping narrow pieces. These, often caught by the saw and hurled back like an arrow, are extremely dangerous. After a piece is cut free from the stock, it should be pushed through with a push stick. If it shows any signs of coming back, the operator should be out of its path and use great care in bringing it free of the saw.

b. Ripping short pieces. The same danger obtains as in *a*.

c. Attempting to push through stock with the fingers when the space is limited. The push stick should always be used on anything where there is the least question of ample clearance for the hand.

d. Attempting to clear away scraps close to the saw with the fingers.

e. Crossing the hand over the saw. By this is meant the position assumed when the operator stands at the left of his stock and attempts to push through a piece between the fence and saw at his left. This makes him reach over the saw with his fore arm and should he not gauge his distance accurately there may be immediate need for a tourniquet. If the cut is wide and the waste narrow, the operator should stand at the right of his stock and control the job on the fence side of the saw, allowing the waste to fall clear on the table.

f. Backing out of long cuts when the saw is running. There is always danger that the saw will catch the board and drive it toward the operator. If circumstances arise that make it necessary, the saw should be shut down.

g. Pulling short pieces through with the left hand while feeding with the right. If it is necessary, no grip for pulling should be taken but merely a pressure down sufficient to keep the piece to the table and fence. A push stick should be used to feed. This sort of thing is always dangerous and should never be done alone if a helper is available.

h. Pulling through short pieces. If it is necessary to take hold of a board within eighteen inches of the saw, it is dangerous and the helper should merely hold the piece down with a stick and allow the operator to push the stock through with the push stick.

i. Sawing holes in stock by pressing down a piece over the saw. This is not infrequently done in making holes for drawer fronts. It is an exceedingly dangerous procedure and should never be attempted. The teeth on the back of the saw are very likely to catch the stock and, if it is being held down with the left hand, that hand may be whipped into the saw in an instant.

j. Attempting to rip more than one piece at once. Occasionally some boy hits upon the idea of stacking several thin pieces and running them through together.

The Machine as a Cut-Off Saw

1. How is the cut-off fence adjusted?

All its adjustments for angular and square-end sawing should be demonstrated or pointed out.

2. How is the length gauge adjusted?

On some saws it is possible to put the length gauge on the wrong side so that it will foul the saw. This sort of thing can sometimes be avoided by plugging a hole in which the rod fits. If this sort of maladjustment by a careless operator cannot be prevented by changing the length gauge, every effort should be made in the way of instruction to prevent it.

3. Should the rip fence be used as a length gauge so that the stock may extend on the right of the operator?

No. If this is desired and there is no special appliance to take care of this, a block may be clamped to the table on the right of the saw as a stop. If the fence is used, the sawed-off pieces are very likely to foul between the saw and rip fence, and damage both the machine and the operator.

4. What are the dangers to the operator?

a. Holding the hand in line with the saw while cutting dadoes or rabbets. This is a frequent source of accident because the saw is out of sight.

b. Attempting to cut pieces when the stock is too short to hold firmly against the cross cut fence. The danger here is that the piece may roll to the right under the force of the saw.

c. Cross cutting mitres with the fence at an acute angle with the saw. The piece may easily slip, foul the saw, or throw the hand into it.

d. When using the type in which the cross-cut fence operates in a slot, it is very easy to pull the fence back and allow it to fall on the feet. The guides are not heavy enough to balance it. This danger is not present in the rolling table type.

e. Trying to cut pieces in multiple by stacking several boards.

The Tilted Table

1. How is the table tilted and locked?

2. What are the dangers to the operator while using it?

a. The fence may slip from the table unless securely fastened before tilting.

b. If the table is not well balanced, it may come back to the level position while the operator is stooped to adjust and lock it, and in so doing may mash a hand or bump a head.

(To Be Continued)

OBJECTIVES AND LESSON PLANS

Mr. C. A. Kunou, director of manual training at Los Angeles, Calif., supplies his teachers from time to time with helpful aids in teaching. One of the recent communications to his instructors contains the following statement of objectives and typical lesson arrangement for the grades.

Sixth Grade

Problem: A box for school, for home, for self, for someone else.

Plan: 1. Make a drawing. 2. Study material. 3. Make specification, calculating material and cost. 4. Carry out the plan, constructing the object. 5. Finish object; paint, stain or shellac. 6. Examination of work, determining standard of attainment, efficiency and skill.

Functioning of Lesson: Leading to subsequent activities, by the revelation of variation of type, as to dimensions, proportions, constructon and uses. The making and executing of a plan: The ability to supply one's own and others' needs; to be skilful and handy; the having of a limited knowledge of constructive processes in a miniature way; the reasoning by generalizing through experience; of being useful in school and in the home.

Right Interest versus Wrong Interest. Manual training is industrializing and socializing in its influence. It is so, not because of the economic demands for objects in the school or in the home, but because it secures the educational interest of those for whom it exists—the children. Categorically, children's interests are:

First.—Play interests usually in Kindergarten to fifth grade.

Second.—Home interests usually fifth to eighth grade.

Third.—Social and school interests, predominantly in the high school grades.

Manual training ought, therefore, be arranged so as to secure these interests. That success of the work is based upon the pupil's interest, that is to say, his attitude, his "likes and dislikes" is not true. To cater to such interests or to interest based upon novelty of things is as an educational practice, fatal. The signs following such practice are unmistakable. These signs are:

First.—Disorder, violence and noise in the manual training room.

Second.—The con-committant inaccuracy of the work.

Third.—The work is neither preparing for vocation nor for education.

Fourth.—The teacher is uncertain, unhappy, always trying to explain away the miserable situation by the alludation to some mystic philosophy about self-expression, etc., when it is evident that the work is wrong.

On the other hand, in rightly arranged manual training work, interest grows with the progress of the work, pupils becoming conscious of accomplishment and achievement. The work *takes,* and this is the right kind of interest. Again, interest may be at zenith when beginning work, and as it progresses the novelty passes and interest will vanish. This is the wrong kind of interest. It was built on sand, upon the novelty of the thing. Let the pupil's interest be represented by 100 at the beginning of a piece of work. Now, if the work is based on his individual liking only, it may be disinteresting to him when the novelty of the thing wears off. So that as the work progresses interest—the whim—finally vanishes and may be represented by "O". The state of this pupil is now worse than the state of the pupil who begins work with interest at "O" and ascends through difficulties to an interest that comes by moral conquest and achievements.

To secure the right interest methodical arrangement of the work is absolutely necessary. And where right interest is secured the signs following are,

First. Order and harmony in the room.

Second. Accuracy in the work.

Third. The teacher and pupil are happy. It is *taking* and there are no disciplinary struggles, because the work is disciplinary in nature.

It is the methodical arrangement of the work that counts. Each pupil begins work, and proceeds by a method which prevents him from over-reaching or under-reaching himself, and by which his true and continuous progress is promoted. Thus, this will show that rightly arranged manual training courses are not "stereotyped" or dogmatic, but that there is methodical progression in the work.

TYPICAL MANUAL EDUCATION ROOM IN THE LOS ANGELES CITY SCHOOLS, LOS ANGELES, CALIF.

Suggestions on the Care of Tools and Equipment

Jos. F. Barta, Milwaukee, Wis.

ONE of the things which seems to be overlooked by many shop teachers is the care of tools and equipment. Articles have been written about this subject from time to time, but few writers have prescribed any definite way in which the tools and equipment can effectively be kept in order. It is a well known fact that some teachers permit their students to work with planes that actually scrape the wood instead of cutting it. As a matter of fact students are allowed to work with tools that the teachers could not and would not work with themselves.

The real root of the matter is that the boy has never been instructed properly in the use of the tools. How many boys are actually seen giving their planes the "once over" before they begin their work? Most of them do not even take the plane apart and whet the plane iron on their own initiative. They usually start planing just as soon as the board can be clamped in the vise. If the plane works, everything is well. If it does not, they scrape along for a while anyway. Perhaps the teacher does not permit them to do any of the adjusting, but does all of it himself.

Every boy should really be taught to fully regulate his plane no matter what may happen to it. The only way to do that effectively is to have all of the planes taken apart at the end of each period. The plane irons, cap irons, and plane iron screws should then be placed in wooden receptacles made for that purpose. The plane and cap can be left in the drawer or tool cabinet. With all the plane irons gathered in one place, the instructor can quickly check up their condition, and readily single out those that need attention. This extra effort on the part of the teacher is well repaid by the quality and quantity of the work done by the students.

When the students report for work the next day or next week, as the case may be, they are obliged to assemble their planes to begin work. At the first attempt about 95 per cent of my students encountered trouble and seemed absolutely helpless, and those who at least tried to assemble their planes had the plane iron inverted with the bevel on the inside. At that time a demonstration on how to assemble and adjust a plane

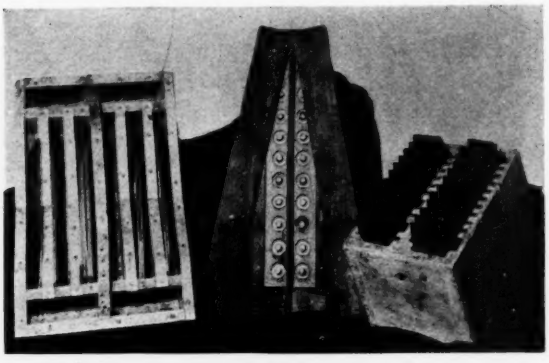


FIGURE 1.

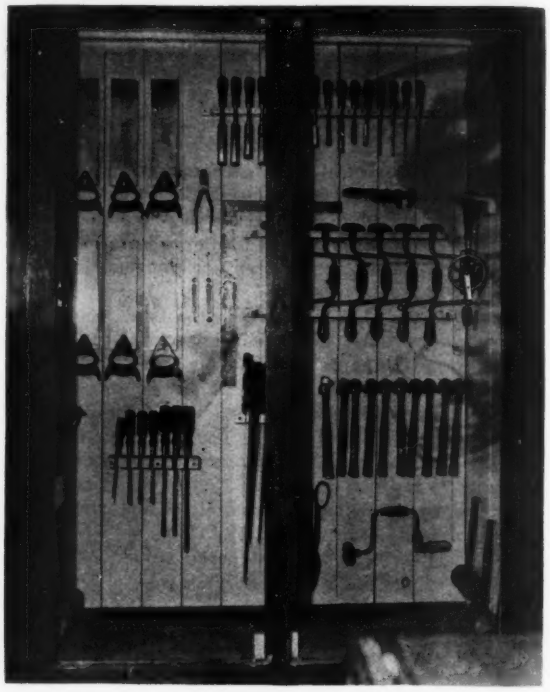


FIGURE 2.

was all that was necessary to make the new system work. It is surprising to know how little students know about the tools they work with, even though the above-mentioned class had had from one to three years of manual training in the full-time schools. The only disadvantage of the system is that constant checking is necessary on the part of the teacher to see that all parts are returned to their places at the end of each period.

Another method used effectively in shops where each student is provided with an individual drawer in the work bench is to issue to each student the parts mentioned to keep and use until the end of the term.

The sharpening, whetting, and strapping of plane irons by the students should form a separate lesson. Old and worn plane irons should be kept in stock and used for that purpose. After a student has learned to sharpen an old plane iron satisfactorily, he should be permitted to do the same with the plane irons in regular use. Sharpening tools on electric grinders requires considerable skill, and very few students are able to do a good job the first time. Where grind stones are used, less skill is required, and the danger of removing the temper is reduced.

Chisels, spoke shaves, auger bits, and marking gauges should be inspected every week end, because tools which are in constant use are bound to become dull or worn out. A little grinding and filing now and then will keep the tools in first class condition with a minimum amount of effort on the part of the teacher.

Saw filing should also form a separate lesson. A popular booklet on "how to file a saw" issued by a firm

To be blueprinted for School Shop Use Only.
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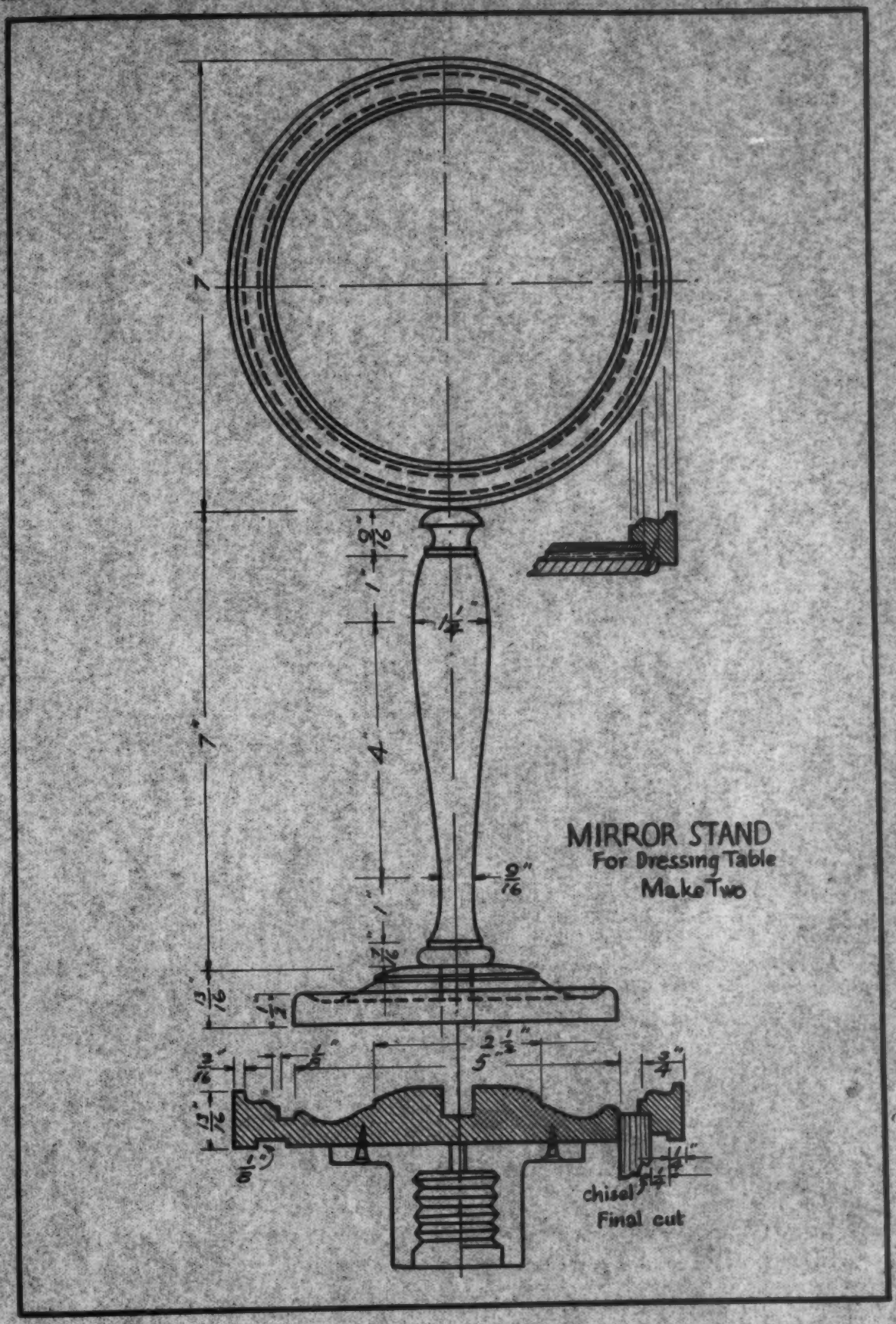

Details of Mirror Stand Designed by Fred J. Evans, Hamilton, Ontario, Canada. (See Page 944.)

TRACING SUPPLEMENT No. 34,
THE INDUSTRIAL-ARTS MAGAZINE,
OCTOBER, 1926.

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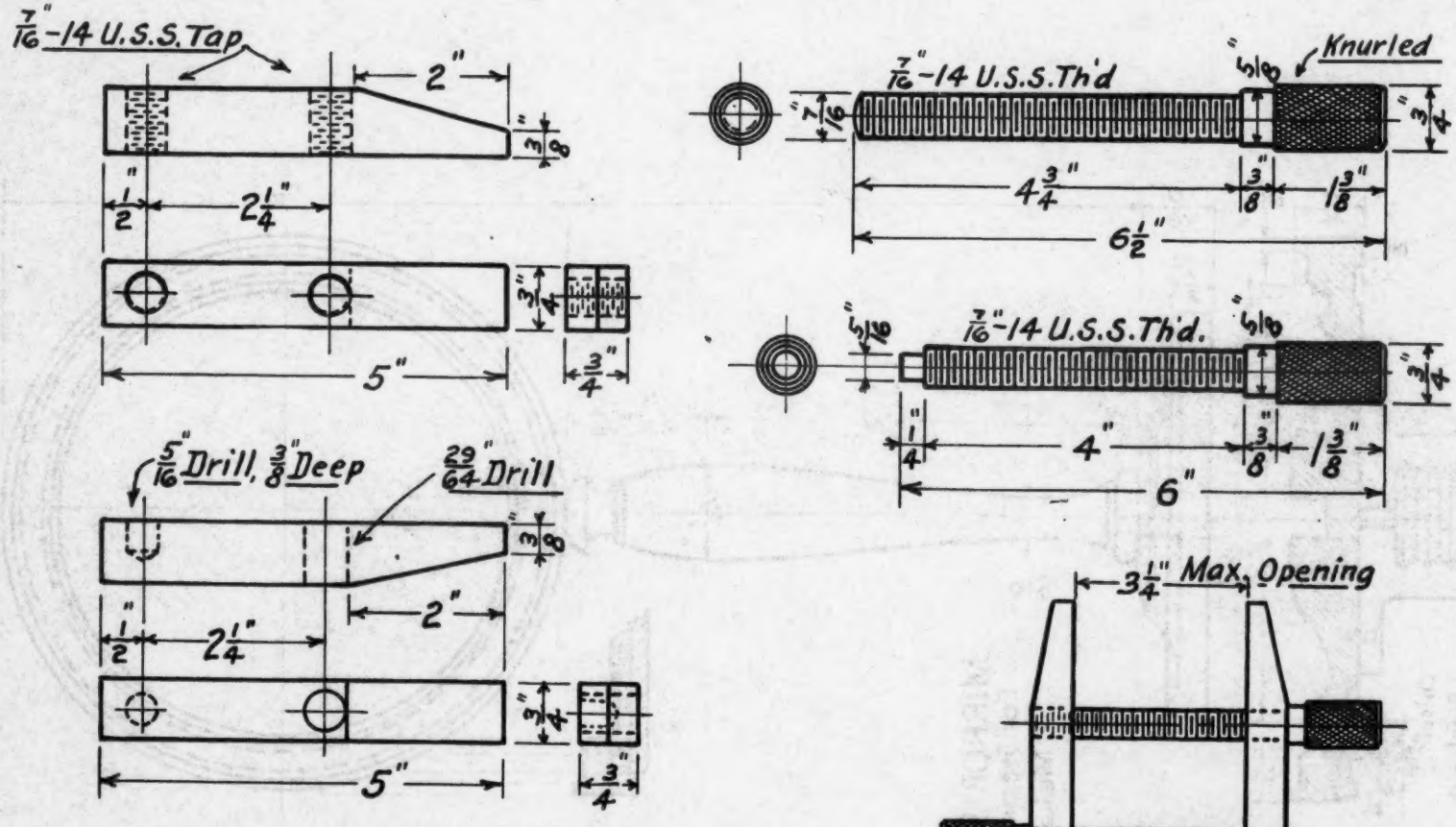


Material = Mach. Steel, Finish all over

MACHINIST'S CLAMP

66

Designed by C. S. Jones, Roosevelt High School, Wyandotte, Mich.

TEACHING SUPPLEMENT No. 84,
INDUSTRIAL-ARTS MAGAZINE,
OCTOBER, 1926.

of well known saw makers can be used in connection with a demonstration. As in the case of grinding tools, filing a saw requires a good deal of skill, and the student should be constantly supervised while doing the work.

Nothing more discourages a boy in a woodworking shop than to work with tools in poor condition. The teacher should, therefore, use every effort to keep the tools in first class condition at all times so that every boy can start off on his work with that feeling of contentment which arises from the knowledge that he is going to get somewhere with his work.

The condition of the room also has a decided bearing on the attitude of the student. A slovenly, ill-kept room is likely to make the student careless in the use of tools and equipment and necessitates constant replacement. A well-kept tool cabinet and room, on the contrary, has a good effect on the student.

The best results are not produced by depending on the students for the entire upkeep of the shop. The teacher himself must do much of the work. He will find that there is a great deal of truth contained in the following story which he can apply to his own work.

About fifty years ago a poor Italian immigrant landed in Brazil with fifteen cents in his pockets. Today he is known as one of the richest men in the country, owning some of the largest coffee plantations. Upon being asked by a friend "To what one thing do you attribute your success?" he replied, "To not doing everything myself."

INITIATIVE AND THE INDUSTRIAL ARTS

T. P. Fiske, Atlanta, Ga.

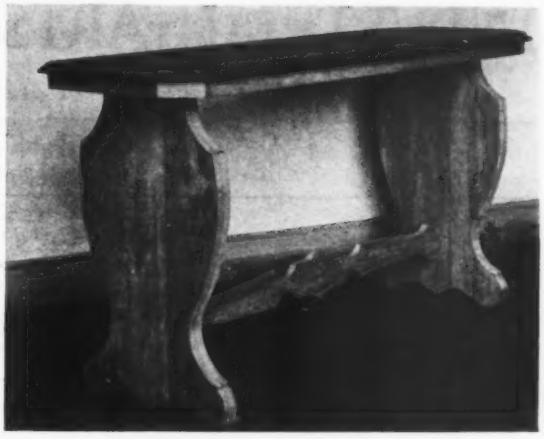
How often is initiative on the part of the pupil considered an aim in the teaching of industrial arts? How valuable is initiative in life and how can it be stressed in the school shop? Perhaps the following account of a project made by a student in the O'Keefe junior high school of Atlanta, will answer both questions.

The accompanying illustration shows a table made by a ninth grade boy. The table is interesting because of the fact that the boy designed it of his own accord and without the help of the instructor. He came to the writer one day with the statement that he wanted to make a hall table. Because no good blue print was available, he was told, "Go ahead and design one yourself, and we will see what can be done about making it. I have red gum and poplar in the stock room." The boy expressed preference for the gum because the rest of the furniture at his home was largely walnut.

During the next shop period the boy took a piece of beaver board and with the aid of a square and a French curve, made a full-size drawing of one end of the proposed table. This was criticized by the instructor and corrected and then sawed out with a turning saw. Four pieces of wood were selected and were glued together with dowel joints, making a single piece 1½"x23"x30". The design was transferred from the beaver board to the piece of wood.

There is no power machinery in the O'Keefe school shop and the boy's next step was to cut out the end with the aid of a Web saw. To do the job accurately was no simple feat. The boy worked faithfully and after two periods succeeded in cutting out one end piece. The difficulty did not seem to discourage him and after about two weeks he had all the parts for the table cut out. The pieces were next cleaned up with the aid of a scraper, a chisel, and a file, and were then thoroughly sanded by hand.

The stretcher had been designed and cut out in the same manner as the end pieces.



THE TABLE AS COMPLETED.

The next step was assembling. This was managed by gluing the top to the ends with dowels, and the stretcher to the ends in the same manner.

After the assembly was completed, the boy proceeded to finish the table. He first raised the grain of the wood with water and then took it down with a blow torch. After this, he sanded the entire table with No. 00 sand paper, dusted it, and applied a coat of walnut stain. The stain was sanded and then a coat of white shellac was applied. The shellac coat was rubbed down with steel wool. Two coats of flat varnish were applied, sanded, and carefully rubbed down.

The table was shown in the spring exhibit and received favorable comment.

This entire project was taught by causing the boy to think for himself and to show initiative in designing the table, planning its construction, and planning the finish. Work of this kind seems far more valuable than any amount of shop work in which a boy simply uses the ideas which are advanced to him in the shape of blue prints. The initiative which this boy displayed should make him ready to meet the problems of the world successfully.

OBJECTIVE TESTS FOR VOCATIONAL GUIDANCE ARE USED BY THE VOCATIONAL GUIDANCE BUREAU AT BERLIN, GERMANY.

The girl is threading fine needles with steel wire to determine her aptitude for a branch of the textile industry.

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INDUSTRIAL-ARTS MAGAZINE

E. J. Lake S. J. Vaughn

Editors

WHAT HAS YOUR LIBRARY TO OFFER YOUR STUDENTS?

As the teachers are rounding themselves into form and preparing to go into a new year, they are naturally planning their work for the year and studying ways and means of making their work more effective than ever before. One thing that seemingly has been tragically neglected in the past should certainly begin to have proper attention and adequate provision. That is the problem of the libraries and the books that they present to the boys and girls interested in the various fields of the industrial arts.

Time and again, investigations have revealed a pitiful lack of books in the school libraries that would make a strong appeal to the students of the arts. It has been assumed that all the books possible in such subjects were textbooks. The English, history, science, economics, and various other subjects have found abundant supplies of materials for reading in connection with such subjects. But, when one comes to the field of industry and art, the very fields in which great advancements have been made in recent years, one finds no great supply of material in the school libraries.

This condition is not due to the lack of material published, for there is an abundance of such books, magazines, and periodicals. It simply takes a rather extended knowledge of the publications of the day to make proper selections. It should certainly be assumed that the teachers of the various industrial subjects keep well enough abreast of the literature bearing on their subjects to be able to provide adequate lists from which librarians may select.

Investigation among librarians shows that there is no disposition on the part of librarians to neglect these lines of work. They say in defense of the condition that they order all the books the teachers ask for. This passes the matter clearly up to the teachers. Let us hope that this coming year may find our libraries with a rich and abundant literature on every possible phase of the various lines of work comprehended in the term, industrial arts.

BROADER EDUCATION IN ART

It is more or less distressing to peruse the courses of study and the curricula of many of the so-called art schools and academies. In the numerous catalogs at hand of various art institutions in this country, the only courses offered with even a semblance of broad culture and social background are such courses as history of art, masterpieces in art, art appreciation, introduction to art, etc. The great literatures, philosophies, and historical movements that produced art and artists are utterly ignored.

There is a rapid muliplication of technical, "practical," manipulative courses designed to produce skill in the technique of the various arts; and this is all very well. But there is a serious lack of courses with great thought content, with historical and literary background and substance, and with any sort of philosophical and social outlook.

Too much of our art study and teaching is on the simple basis of expression and illustration, with no depth of thought or emotion, and no literary or historical ideas and ideals to express. The young art student in all too many cases finds himself everlastingly trying to *express* something with nothing in his mind and heart to express. Consequently, a vast deal of art work is nothing more or less than copying, and the endless emphasis on the technical manipulation of charcoal, water color, oil, pencil, pen, or brush.

The bigger and broader the educational outlook of the artist, the greater and the more significant will be his artistic conceptions and his art creations. It was not accidental that many of the great artists of the past were also great scholars and great artisans. This fact gave to their creations a larger significance, a broader appeal, and a richer thought.

It is to be hoped that those who assume to teach and guide young students and artists may see the necessity of enriching their programs of study to include a large offering of general educational and cultural subjects so that the young "expressionist" may have something to express.

SHOP TEACHERS AND STATE TEACHERS' ASSOCIATIONS

Too many teachers of manual arts and vocational subjects hold themselves aloof from state and local associations of teachers. They seem to feel that they do not "belong".

The shop subjects will not be given the recognition they deserve, so long as shop teachers do not take part in the councils of education and make themselves heard and felt in all movements relating to general educational problems. The few foolish schoolmen who feel an imagined superiority as academic teachers or supervisors, may have a reason for their attitude, if manual arts and vocational teachers do not prove their equality by contributing to the general progress.

The shop teacher has in his own control the winning of the increased respect of the profession.

"Colleges are educating men away from the use of their hands," said Dean C. E. Seashore of the University of Iowa recently. "What we need is a job analysis of society to see just how many learned men we need, how many mechanics, dentists, lawyers, electricians, etc., and then organize our educational system on a basis to provide society with these needed individuals. What we are doing now is the training of every student along the line of liberal arts. Students should be given placement examinations in the beginning of their college course to determine in which course they might be advised to go with best results to themselves and to society."

CHARLES W. ELIOT, ARDENT ADVOCATE OF MANUAL EDUCATION, DIES

I have been roaming among ruins of cool adobe cloisters where Junipero Serra, the Spanish friar, told benighted desert Indians that to make progress they must walk in the trail of God's commands. Here, too, Helen Hunt Jackson gathered the legendary externals for "Ramona" and, with vitriolic-tongued eloquence, portrayed a "Century of Dishonor." What an array of illustrious names and of forgotten attempts to introduce culture into the hovels of our original Americans is suggested by this remnant of an old California mission! But who cares now about the signal services of McCoy and DeSmit or about the sacrifices of Brainerd and Sargent or about the heroism of the Friars? Trippingly across the ancient patio tiles comes the headline refrain, "The Original Shiek Fights For His Life!" Alas, who cares today about the humanitarians of yesterday? Of course newspaper editors have genius enough to know that we would not consider sufficiently the distinct cultural loss America suffered in the passing of Charles W. Eliot and Professor Stuart P. Sherman. Now, one of these exponents of culture, Professor Sherman, wrote the most stimulating essays on "vocation" ever published in the English language. In time of need, Doctor Eliot was a staunch friend of manual education.

Rare intellectual power, deep interest in his fellowmen, and other qualities of educational leadership did not come to Doctor Eliot adventitiously; they were his by right of birth. His paternal line courses through several affluents far up-stream to the Reverend John Eliot—scholar and linguist. Back near the dawn of New England history, in October, 1646, this ancestor unfalteringly accepted the challenge of a Massachusetts General Court decree and prepared himself to wrestle with superstition in the wilderness.

Somewhere, perhaps it was in one of the notable Eliot genealogical chronicles or journals, I recall that conspicuous mention is made of a noble family tradition: All Eliot boys of high school age are to be afforded an opportunity of externalizing their unique ideas by means of tools. During the far-famed Boston Conference on Manual Training, held in 1891, Doctor Eliot stated that the wisdom of his parents caused him to be taught carpentry and turning in wood before he was 15 years old, and while he was yet a member of the Boston Latin School. Undoubtedly the tradition was faithfully lived up to by other branches of the family as well. For, upon a rather auspicious occasion, Chancellor William G. Eliot, one of the pioneers of education in the Mississippi Valley, told the board of managers of Washington University that by bringing educated workmen to the bench they would be doing the best work of an American University. So whenever an Eliot speaks about the value of "planing a parallelopiped of iron so well that no light shows under the edge of the try-square," he speaks with the authority of a craftsman who has performed tasks at the bench with his own hands.

In the "Romantic Nineties," when manual training was struggling for recognition upon the shores of a hostile academic world, Doctor Eliot did much to shed glamor and dignity upon the claimant. Moreover, his comments at this time upon the transfer values inherent in the subject and the ease with which "the individualization of instruction" could be accomplished have a strangely modern sound. Always, I have looked upon the plank that Doctor Eliot nailed to the Boston Convention platform as a tide-mark showing how high the waters once did rise. Branded upon it was the modest warning: "Never admit that manual training is anything distinguished from, or in opposition to, mental training."—*Charles P. Coates.*

COOLEY ON PART-TIME SCHOOLS

"Young people in compulsory part-time schools should not be allowed to feel that such schooling is merely a sort of 'stint' to be worked off before complete freedom from school is attained," said R. L. Cooley, director of vocational education of Milwaukee, when speaking before the National Education Association. "These schools must be treated as adult schools because the young people are working and drawing pay checks and demand to be treated as adults," Mr. Cooley continued. His address in part follows:

"An experience of fourteen years in the part time continuation schools under compulsory attendance laws which extend to 18 years of age one full day each week, has emphasized to us the importance of the following points:

"Nothing is of greater importance than that these schools shall not be set up as elementary schools, differing only in that they offer an attenuated program, a sort of 'stint' to be worked off before complete freedom is attained. So long as the young people are made or permitted to feel that they are being snatched back from their new-found freedom, put into short pants for a day each week, there will be increasing trouble and near rebellion. The continuation school must not be regarded as the last rung in the ladder of elementary education. It must be provided, equipped and presented as the first rung of the ladder of adult education.

"The great mass of those who will be required to attend are employed. They are working eight hours a day five days a week, and draw their pay check. They must work from now on—and that is a long time. They may be young but they are through with all school except the part-time school. So far as the great majority of adults are concerned, all adult school attendance must be in part-time schools. The part-time feature characterizes adult education. This grows out of the fact that adults must support themselves and this activity takes most of the time of most of them.

"Because the part-time school must be made an adult school, it should not be assumed that these young adults are to cease attendance at the part-time school at the end of the compulsory attendance period. Opportunities for voluntary attendance, either day or evening, should be provided both in excess of the required period each week and beyond the compulsory age limit of the particular state. The night school is merely another part-time school and should succeed the part-time school as the high school succeeds the elementary school. Night school is not another kind of part-time school as distinguished from the day part-time school any more than night air is another kind of air, as we used to think years ago when our parents called us to come in out of the "night air.'"

PROBLEMS & PROJECTS

This department aims to present a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine shop practice, turning, pattern-making, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration.

A MIRROR STAND

Fred J. Evans, Hamilton, Ont., Canada

(See Supplement No. 33)

A pair of mirror stands makes a nice addition to a dressing table, as well as an interesting lathe project.

Turn the spindles first, from 1½" square stock. Make 7" between shoulders, with a ⅜" pin at the top, and a ½" pin at the bottom.

For the frame and base, fasten a piece of ⅞" stock, 7¼" in diameter, to a small face plate. Turn the edge and face side as per section drawing, and sand. Then reverse the tool rest, and cut the ⅛" deep rabbet for the back. Finally, cut the rabbet for the glass, which separates the frame from the base.

Assemble the spindle and frame carefully, as the short grain in the frame is likely to split. As an alternative, bore so that the grain runs diagonally across frame. Bore the second frame in the opposite direction, so that they form a pair.

Usually enough broken mirror can be found to cut two pieces 6" in diameter. Back the glass up with felt paper, or cardboard, until level with the outer rabbet. Cut a back from ¼" stock, 6½" in diameter. Slightly round the outer edge, and fasten in the rabbet with a few small brass tacks.

The stands may be finished, either in the lathe, or afterwards, as preferred.

FIGURE 1. TABLE LAMP.

A TABLE LAMP

L. F. Hyatt, Canton, O.

One of the interesting projects combining wood turning and chisel practice is a table lamp shown in Fig. 1. This attractive project requires considerable skill and

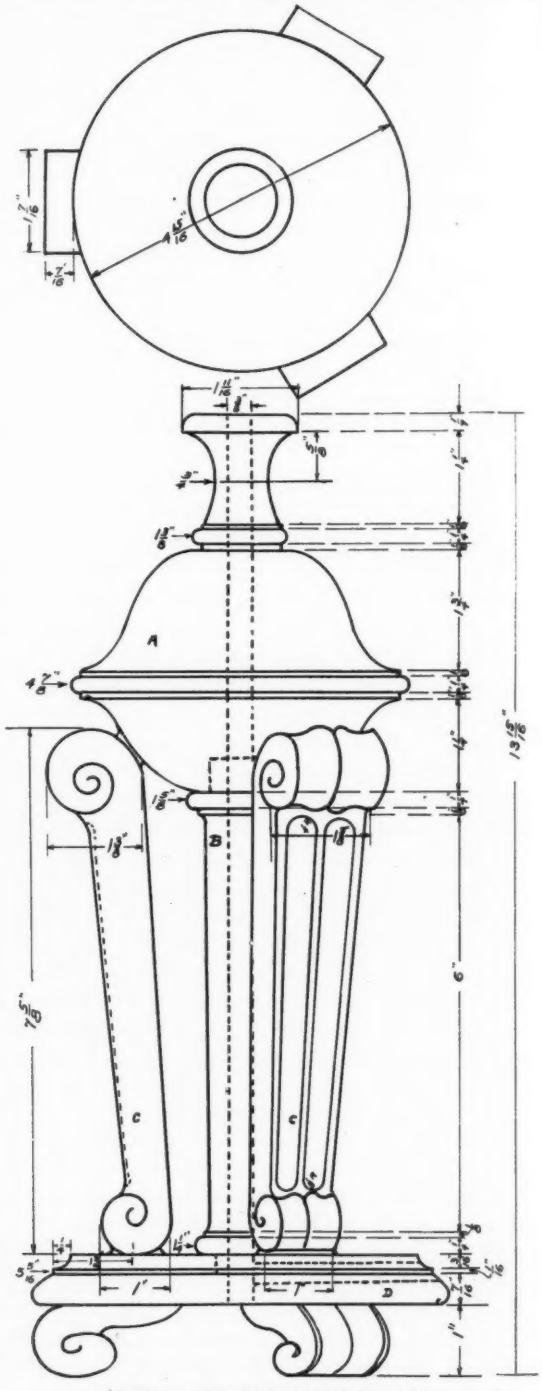
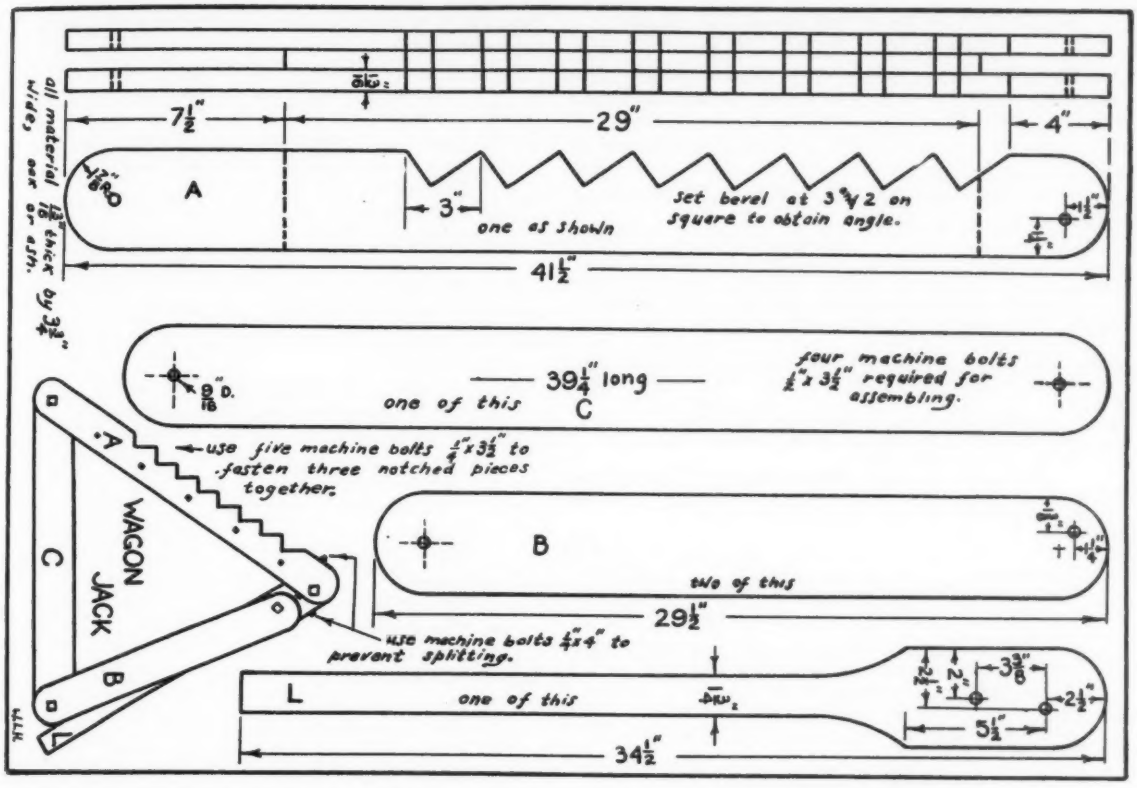


FIGURE 2. DETAILS OF TABLE LAMP.



should be attempted only by boys of high school age, or by grade boys with exceptional ability in handling tools.

Part A and B are turned separately, thereby avoiding vibration and making possible a neater job of turning. After completing and putting on a French polish finish, the plugs in the holes in pieces A and B are removed, and the two pieces are glued together. The three pieces C are sawed to size and then carved. This part of the work requires great care and considerable time. These carved pieces are fastened to the base D with 1½" No. 6 wood screws, and at the top with ¼" dowel pins. It is important that the work be neatly done where piece C is fastened to the ball part of the lamp.

The base should be turned, and the feet sawed out and carved, then glued and screwed together. A hole is bored into the edge of the base to connect with the hole through pieces A and B to receive the cord.

A two-socket chain-pull fixture is perhaps preferable for this lamp. A shade of Parchment paper, or a wire frame covered with silk, completes the lamp.

A WAGON JACK

William L. Hunter, New York City, N. Y.

The wagon jack shown demonstrates the mechanical advantage obtained by the use of levers. Two classes of levers are used. The handle (part "L") of the jack exemplifies the first class of lever in which the fulcrum is between the weight and the power exerted. In this handle, the length of the longer arm is slightly more than eight times the length of the shorter arm so that with this lever alone a person would be able to lift eight times his own weight. However, the notched piece (part "A") represents a lever of the second class, which is used in conjunction with the handle or lever of the first class. In the second class of lever, the weight to be lifted is between the fulcrum and the power applied. The fulcrums are represented by the large bolts, around which the levers partially turn when the jack is operated. The particular notch of part "A," on which the wagon or weight happens to rest, determines the mechanical advantage which we are able to obtain with this second class of lever. If the weight is half way between the fulcrum and the power applied, we would be able to lift twice as much as if the weight were at the extreme upper end of the notched piece vertically above the large bolt. Thus, by combining the two levers and taking a case where the weight is half way up on the notched piece, we can see that a boy who weighs 100 pounds would be able to lift a weight of 1,600 pounds, provided we assumed that there is no loss of energy due to friction.

Little trouble should be had in the construction of this project as no difficult tool processes are involved. Care should be taken to check all measurements quite carefully so that bolt holes will be in the proper places. Where two or more pieces are used together, the holes had better be bored or the notches cut while the parts are clamped together. In some cases the construction of this project will be somewhat simplified, if instead of semi-circular ends, the corners are cut off at 45 degrees. However, this detracts considerably from the neatness of appearance when the parts are assembled. The bolt holes are so placed that the handle locks itself when at the lowest position. If quarter sawed wood is used, there will be less likelihood of splitting to occur and also less trouble from warping. As is indicated in the drawing, there is a bolt through the handle piece, and also through each of the two long notched pieces to preclude any chances of splitting. Care should be taken that none of the members is reversed when assembling.

This jack is made for heavy farm service where wagon wheels, or wheels of other heavy machinery need to be greased or removed. Its quickness of operation, and the self-locking feature, render it especially desirable. The weight which can be lifted and the ease with which it is done, make the project most welcome in rural communities.

WHAT DO YOU DO WITH YOUR OLD FILES?

Olin E. West, Waverly, N. Y.

In small school machine shops making scrapers does not begin to fill the bill. The article the boys find most interesting is a hunting or skinning knife. As this is a farming section the country students make sticking knives for their own butchering purposes. The sheaths are made from short belt ends. Here is economy in an interesting form.

A Job Sheet

Project: Hunting, skinning, or sticking knife.
Operations: Annealing, rough grinding, forging, finish grinding, drilling, tempering, riveting, sharpening.
Tools: Emery stone, oil stone, drill, forge, hammer, tongs, anvil.
Materials: Ten inch flat file, No. 12 copper rivets, handle. (Three-cornered files can be drawn down successfully.)
Process:

1. Break off tang, anneal and grind out teeth.
2. Mark off 4" of the large end for handle core.
3. Forge down wedge shape.
   Note: Do not heat over a cherry red. Do not cool part of a heated knife in water without immersing the whole knife, as it will crack at the water line.
4. After shaping and smoothing on the anvil, grind flat on both sides. Do not grind to a fine edge until after tempering.
5. Drill two $\frac{1}{32}$" rivet holes in the handle.
6. Heat knife to a cherry red and immerse quickly in water.
   (a) Heat a bar to a red heat. Lay the knife FLAT on the bar, turning it over now and then.
   (b) Temper to a medium straw color.
   Note: A heated pipe or hot oil will also serve.
   Warning: Hold knife flat to prevent warping.
7. Sharpen.

A THREAD CLEANER

Otto Lundene, Michigan School for the Deaf

The thread cleaner shown in the accompanying drawing was designed for cleaning the threads on chucks and lathes. The tool is adaptable for external as well as for internal thread cleaning, by simply turning the sliding post half way around, and replacing the screw. By setting the points so they fit into the bottoms of the thread to be cleaned, tightening the set screw and threading the tool through, it is possible to cut any dirt or sediment lodged in the thread.

Order of Operations

Material—Tool Steel or Machine Steel

Job No. 1—BASE.

1. Square and trim stock to size. (This may be done on a milling machine or shaper.)
2. Mill center slot.
3. Mill end slot.
4. Mill slide.
5. Chip out the ends on the slide.
6. Drill end holes.

Job No. 2—END POST.

1. Cut to shape and size on milling machine.
2. Grind points.

Job No. 3—SLIDING POST.

1. Cut to dimensions in milling machine.
2. Grind point.
3. Locate center for drilling.
4. Drill and tap hole.

Job No. 4—SCREW.

1. Chuck stock.
2. Turn to size.
3. Knurl.
4. Cut off.
5. Cut thread.
6. Polish.

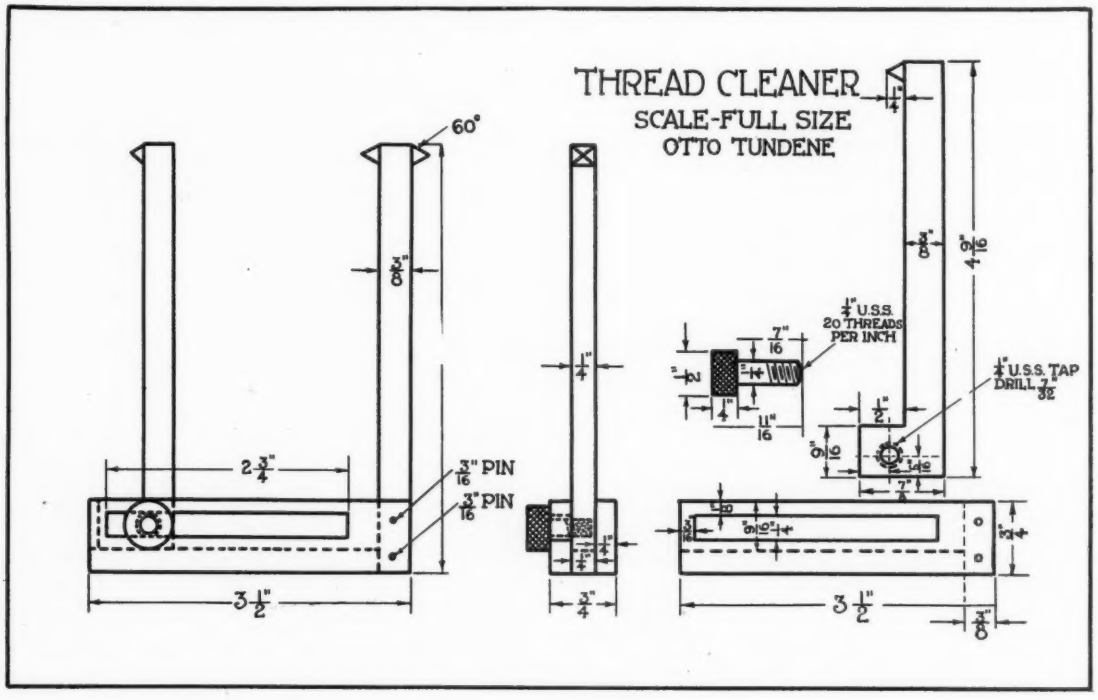
Job No. 5—ASSEMBLY.

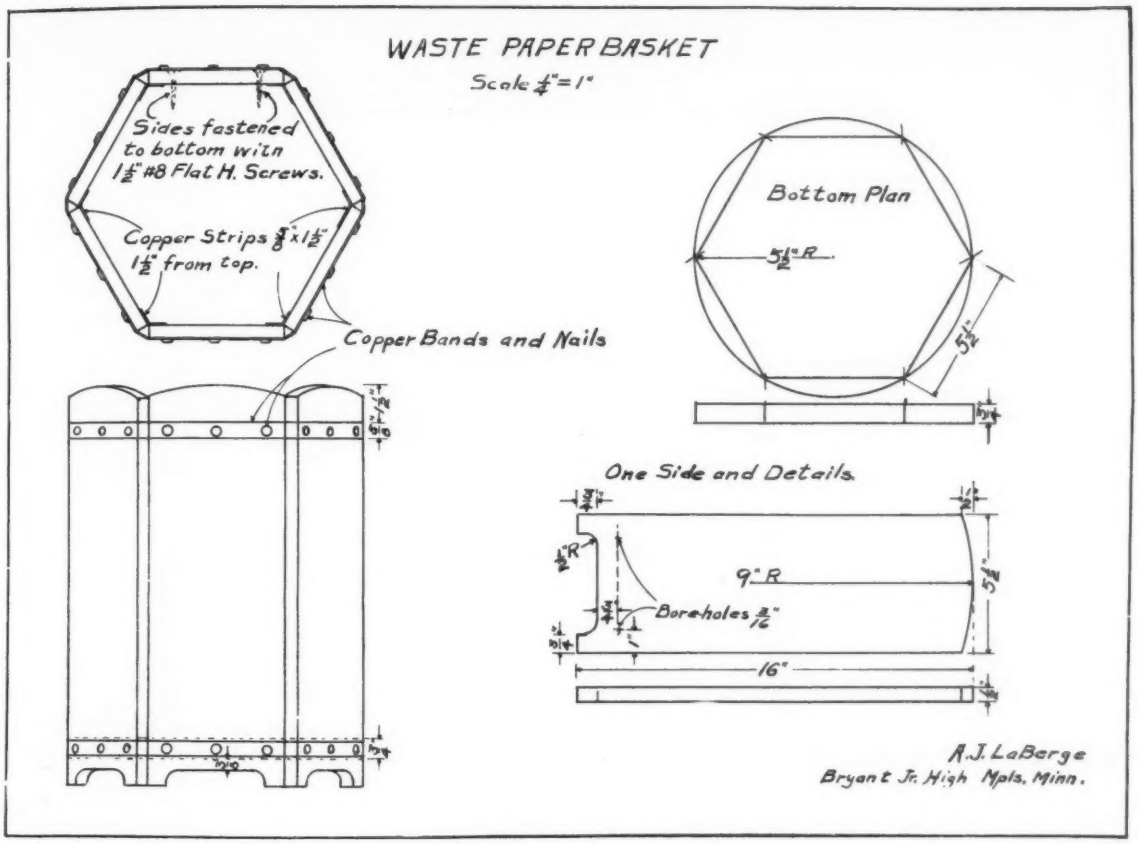
1. Fit and set end post.
2. Drill holes for rivets.
3. Rivet.
4. Adjust slide.
5. Polish and remove any marks.

A WASTE BASKET

A. J. La Berge, Minneapolis, Minn.

The special interest that boys take in projects of the constructive type, which have commercial value, has been observed time and time again. The accompanying drawing is that of a waste basket. It is simple in construction and is surely one of the most useful projects that a boy



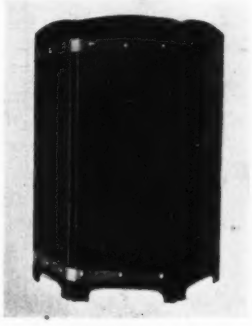


DETAILS OF WASTE PAPER BASKET.

can make. The joints are all butt joints, glued and screwed together with 1½" No. 8 flat head screws.

The operations involved in the construction of the problem are the squaring of several parts, considerable coping saw work, and spoke shave work.

The selection of wood for this project is a matter of choice. Red gum has been used in the author's classes with a great deal of satisfaction.



WASTE PAPER BASKET.

The copper bands and nails placed near the top and bottom of the basket, add considerably to the appearance of the finished project. The short copper strips nailed on the inside of the basket at each corner, opposite the upper outside band, helps to make the job more solid and lasting.

An effort has been made to keep the problem as simple as possible within the power of the 7A and 8B grade pupils to construct.

A DESK NOVELTY

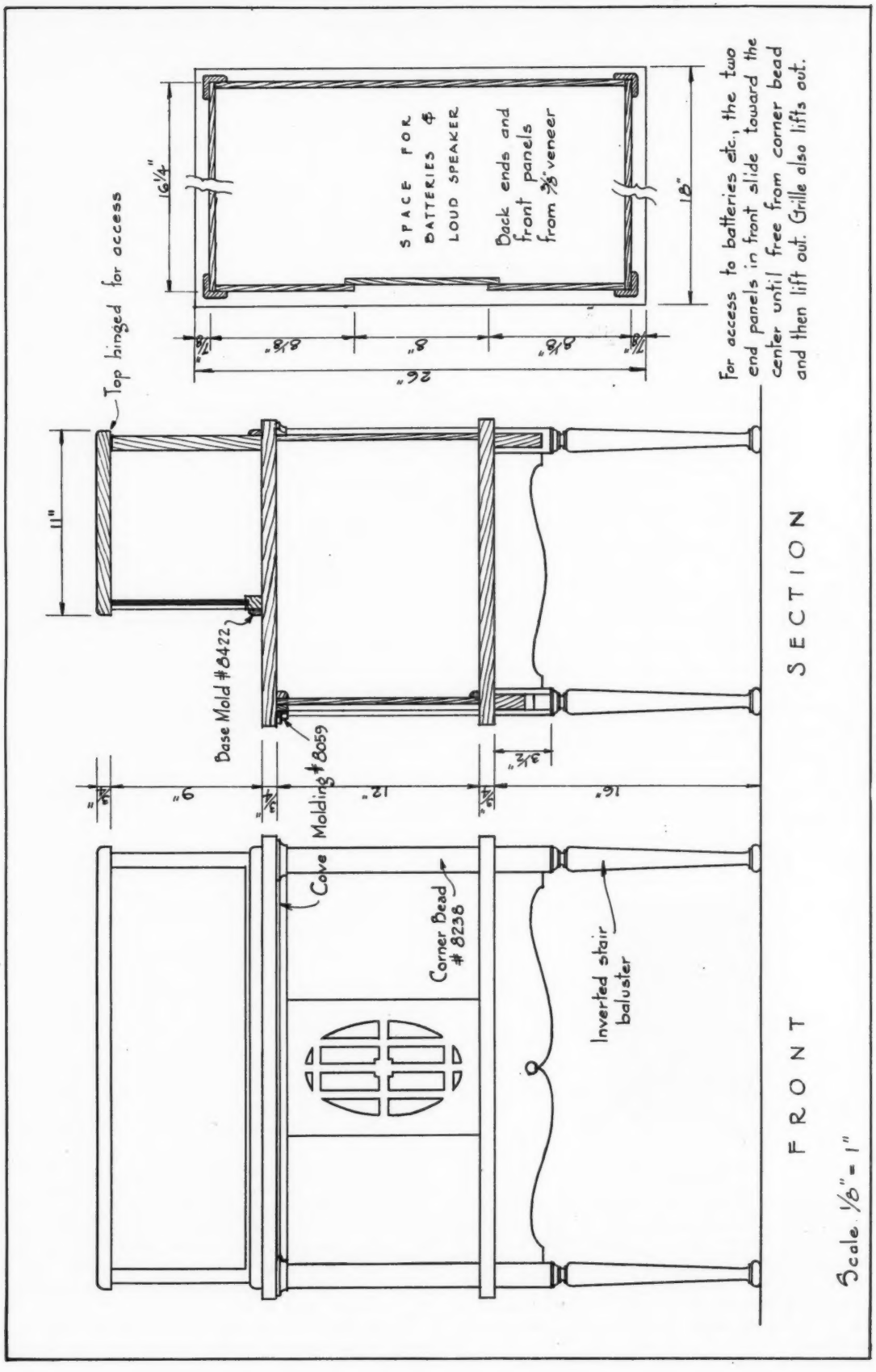
Daniel Darney, Director of Manual Arts, Leominster, Mass.

The novelty in the form of a desk calendar which the boys in the printing classes produce each month has attracted favorable attention to the department. Its arrival, each last week of the month, is looked forward to with interest by the people on our list. Schoolmen in the neighboring cities, the local business men, officials of the school department, the other city departments, and the boys are reminded that the school print shop is alive. These people let us know promptly if, by any chance, they do not receive their copy.

When folded and pasted the desk calendar is triangular in shape. The front and back of the calendar measure two and three-fourths inches wide and two and three-fourths inches tall. The base is two and three-fourths inches wide and two inches long. The lap which is pasted to the front of the back is one-half inch wide. The calendar is printed on a piece of index bristol board two and three-fourth inches wide and eight inches long. After printing it is folded on the creases, made by the brass rule, and pasted. A different colored index board is used for each month.

The front of the calendar carries a No. 13 Perpetual Calendar with a quotation beneath. This quotation is set the width of the perpetual calendar. A light face type is used when the quotation is long and a heavy face type is used when the quotation is short. Below the quotation the words Leominster School Press in small type are printed. These words are on a linotype slug prepared in the local newspaper office.

The back of the calendar carries information, set the width of the copy on the front, which it is hoped will be


Top hinged for access
16¼"
SPACE FOR BATTERIES & LOUD SPEAKER
Back ends and front panels from ¾" veneer
18"
26"
For access to batteries etc., the two end panels in front slide toward the center until free from corner bead and then lift out. Grille also lifts out.
11"
Base Mold #8422
Molding #8059
Cove
Corner Bead #8238
Inverted stair baluster
FRONT
SECTION
Scale ⅛" = 1"

DETAILS OF THE RADIO CABINET.

of interest to those who receive the novelty. The copy for this year's edition are lists of school officials, the principals of the different buildings in the school system, and the teachers. Other editions have carried information of a more interesting nature to those not connected with the school department.

Last year a drive was made in this city to create an interest in the need of a new school building. A list of fifteen reasons, prepared by the superintendent of schools, furnished copy for a few months. Facts about the city, its population, its varied business interests, and facts about the schools served for copy. Once a start is made the collection of copy is easy.

The project, issued monthly as it is, furnishes experience to the boys, in a small way, similar to that of publishing a school paper. The calendar is so small and the space for copy is so limited that the boys can do all of the work themselves. The copy can be prepared in the English and typewriting classes.

1926 APRIL 1926
SUN MON TUE WED THU FRI SAT
1 2 3
4 5 6 7 8 9 10
11 12 13 14 15 16 17
18 19 20 21 22 23 24
25 26 27 28 29 30
WILLIAM GOODHUE
JOB PRINTER
13 APPLETON PLACE
TELEPHONE 883-M

A DESK NOVELTY.

The copy for this calendar is prepared months ahead. This is necessary if the calendar is to be issued on time. At the present time the calendar for the following month is printed the first of the previous month. These are held in the print shop and released the last week of the month. This practice insures publication on time.

In an earlier paragraph a few of the subjects for copy on the back of the calendar were suggested. There are many more to be found in your city which will be of interest to the people.

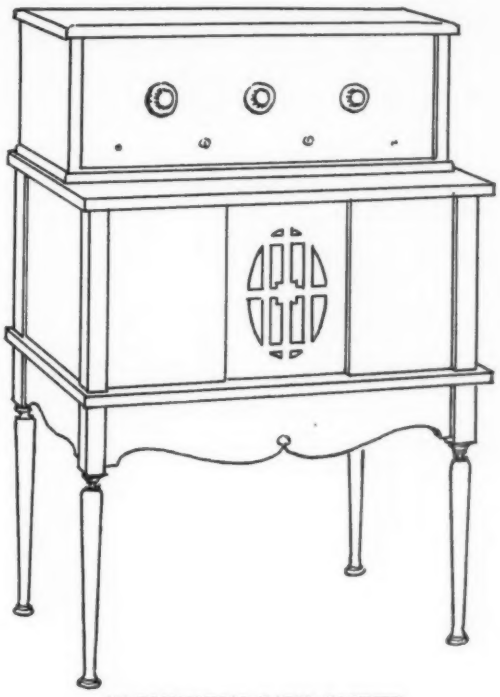
At the present time copy for the entire edition for the school year 1926 and 1927 is being prepared. This is a list of holidays, historical dates, and other information about the month on the calendar. We hope to send out the calendars for July and August with next year's June issue.

If you are seeking a simple printing project, within the ability of boys, which will remind the people of your city that your department is alive, try this little desk novelty which will stand on their desk, before their eyes, the entire year.

AN ECONOMICAL RADIO CABINET

Gladstone Califf and Arthur Christiansen, Fairfield, Iowa

This radio cabinet is designed with the idea of using moldings, etc., which can be purchased at any lumber yard. The numbers indicated on the drawing are taken from the "Universal Mill Book" and are standard throughout the country. The legs are made from turned stair balusters inverted. The height of the lower portion of the cabinet will, of course, be governed by the length of the stair baluster selected. Only general dimensions are given because the details will be governed by the exact sizes of the materials.



AN ECONOMICAL RADIO CABINET.

This design is very economical. The lumber should be yellow pine or white pine.

If desired the cabinet can be stained and finish applied to match other furniture, but it was designed to be enameled or lacquered and decorated with stencil or transfer designs. If the cabinet is to be stained the veneer panels should be set with the exposed grain vertical.

Bill of Materials

4 pc.—1⅜″ x 1⅜″ stair balusters.
1 pc.—¾″ x 3½″ x 25″ apron.
2 pc.—¾″ x 3″ x 16″ apron.
1 pc.—¾″ x 3″ x 25″ apron.
2 pc.—¾″ x 18″ x 26″ bottom.
1 pc.—23½″ x 12″ veneer back.
2 pc.—16¼″ x 12″ veneer ends.
2 pc.—7¾″ x 12″ veneer front.
1 pc.—9″ x 12″ veneer front.
1 pc.—¾″ x 11″ x 26″ top.
1 pc.—¾″ x 9″ x 24¾″ back.
2 pc.—¾″ x 10½″ x 9″ ends.
1 pc.—¾″ x 1″ x 24¾″ panel mold.
11 lineal ft. base mold, No. 8422.
8 lineal ft. cove mold, No. 8059.
Nails, screws, etc.

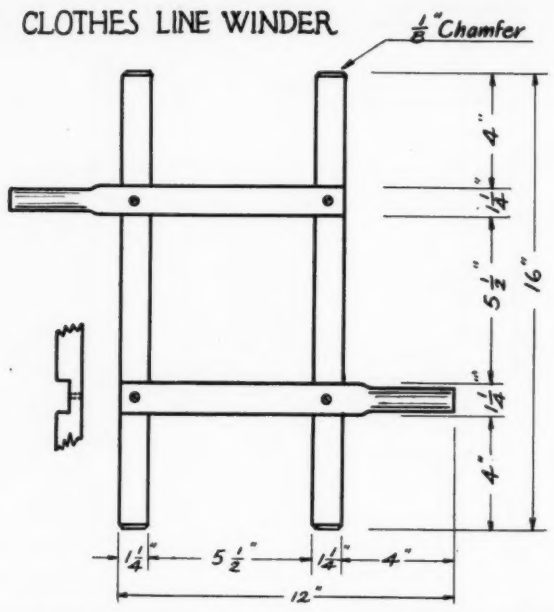
A CLOTHES-LINE WINDER

Kenneth W. James, Detroit, Mich.

One of the things necessary for the home in the large city is a clothes-line winder for removing the family wash from the line. It is generally the task of the boy to wind up the line after it is no longer needed, and the problem of a clothes-line reel becomes of added interest to him.

The problem presented not only serves the purpose intended but offers sufficient tool practice to make it of value as a shop problem. In addition to the basic squaring-up processes, it contains such processes as chamfering, half-lap and end joints, and rounding of handles.

All the pieces are made from 13/16″ stock. After the four pieces are squared to dimensions, the chamfer is made around the ends of the long pieces, and the joints



are laid out. The handles may be rounded, either before, or after the winder is assembled. The joints are secured by means of glue and ¾" flathead screws. When assembled, the winder may be stained or painted, to suit the boy. Some kind of a holder for the end of a rope may be put on the winder if desired.

A PROBLEM IN MECHANICAL DRAWING

Clarence E. Turner, Fort Collins, Colo.

The accompanying drawings illustrate three methods of locating point A on the top view of a truncated triangular pyramid, when the front view is given as shown.

In Figure 2, BC is constructed equal to ED. AH is constructed parallel to GC. HC equals DF. This locates A as F in the top view.

A fourth method is by proportion as follows: (Fig. 2) BG:ED=AG:FD. FD is the unknown dimension.

LINOLEUM PADS FOR VISES

G. E. Myers, Everett, Wash.

Small pieces of battleship or other good grade of linoleum make excellent pads for woodworking vises. They not only entirely prevent any bruising of the wood, but they enable the vise to hold more firmly. Pieces which have a slight taper, or which have a small surface are held without slipping.

A pattern can be made of ply-wood to fit the vises and from it any number of pads can be cut with rapidity. They can be glued in, or if properly cut, they will stay in place without fastening.

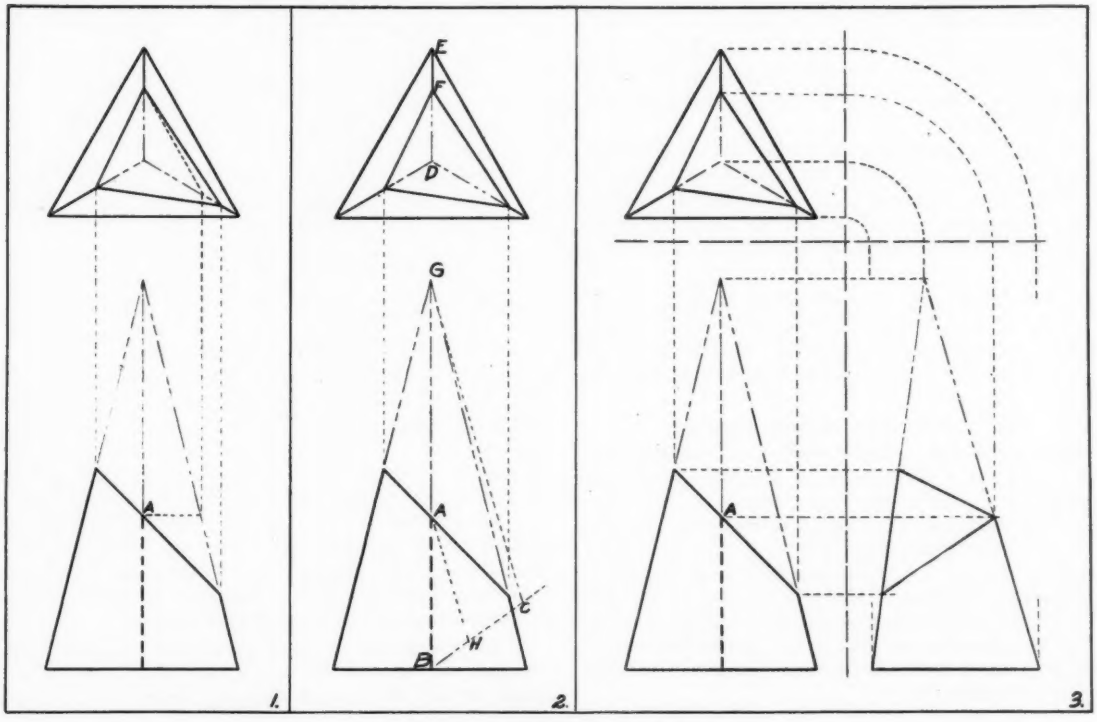
MAKING THE SAND BELT JOINT

C. C. Hermann

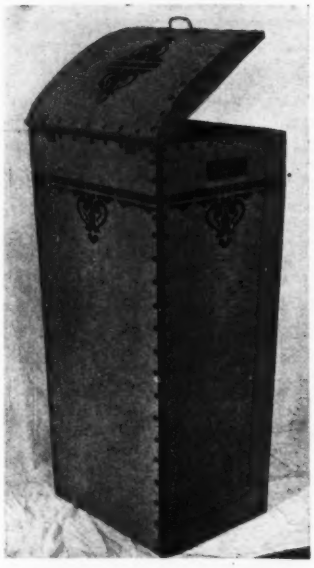
The condition of the belt joint on a sanding machine influences the class of work produced to a remarkable degree. The most experienced sander will produce poor work if the joint has not been properly made.

The principal requisite of a good belt joint is that it be evenly matched and of uniform thickness with the remainder of the belt. If not evenly matched, the belt will chatter on the pulley, making it very uncomfortable to work upon and producing inferior work. If the joint portion is thicker or thinner than the balance of the belt, the work will come out wavy and far from smooth.

Different mechanics use different methods in making the belt joint, however, the objective should be the same in all, namely evenness of match and thickness. One method widely practiced is that of splitting the thickness of both ends, cutting off the respective flaps and gluing together so as to overlap. This kind of a joint is sufficient, provided we go one step further and glue a strip of good strong cloth over the back to prevent the hand block from turning up the edge of the belt. Without this reinforcing, the hand block will soon rub up the edge of the belt, fold the edge back, and every time this point comes

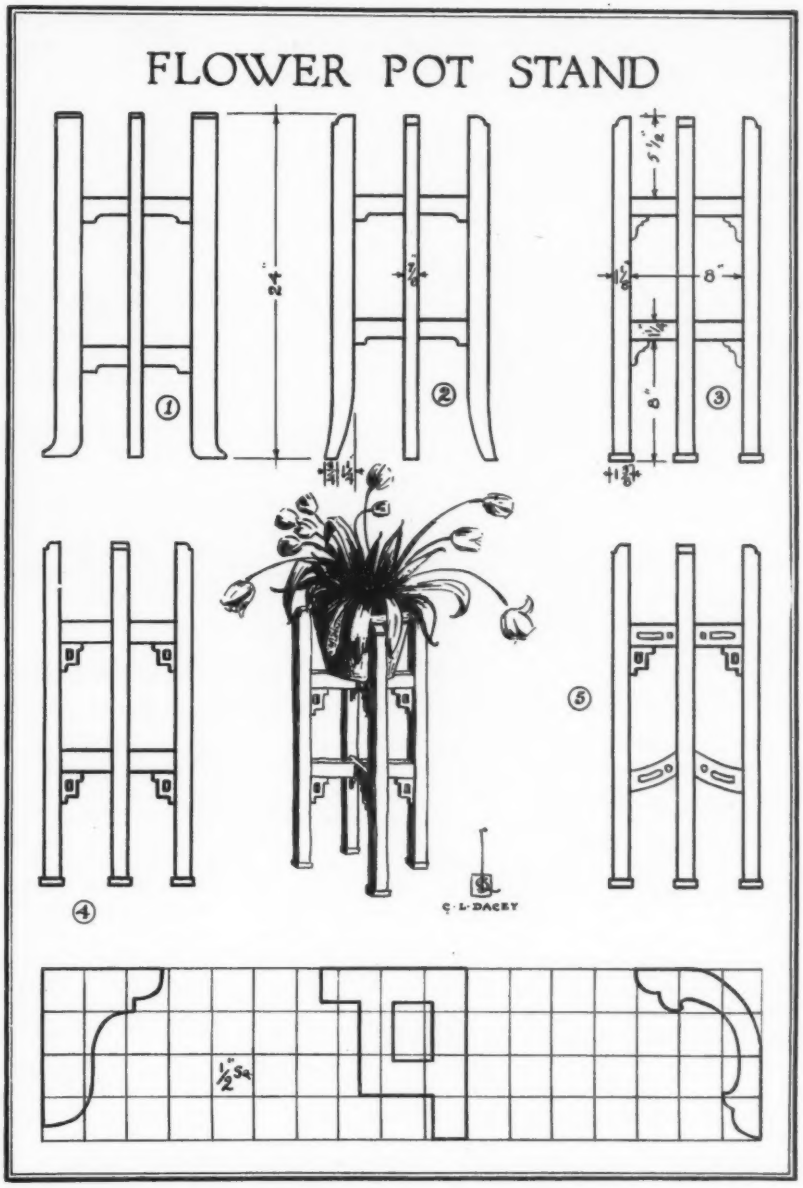


A PROBLEM IN MECHANICAL DRAWING.



A USEFUL CLOTHES HAMPER.

This clothes hamper is made of soft wood frame and is covered with wall board. The construction is of the simplest and the size is adapted in each case to the needs. The entire hamper is painted and ornamented with a simple stencil. Brass tacks are used both to hold the wall board and as an ornament. The hampers have been made a success by the students of Mr. W. W. White, Waterloo, Iowa.



DETAILS OF FLOWER POT STAND.

under the block it will produce a variation in the surface of the work.

By using the necessary care in splitting the belt, the thickness of the belt at the joint should be the same as the balance of the belt. The nature of the glue and the way it is applied will affect the working of the joint as well as its thickness. The glue should be comparatively thin and allowed to soak in well. Too much glue will produce a stiff joint and result in a crack, eventually starting at the edge of the joint. The stiff portion will not pass under the hand block in a uniform manner and lay flat between the block and work like the balance of the belt, causing waves in the work surface. The glue should not extend beyond the edge of the joint. This is prevented by using a brush strip at the end of the brush stroke. When the brush stroke passes beyond the lap edge it produces an extra stiffness in the belt.

The "U" joint cutter has proven to be a remarkable time saver for making sand belt joints and much of the trouble inherent in the ordinary joint is eliminated by its use.

Regardless of the joint selected, the belt must have square ends at the start. A crooked joint will invariably result if the ends of the belt are crooked. Use a try-square and see that the belt is properly squared and trimmed before doing any more on the joint. Use glue sparingly yet in sufficient quantity to produce a good joint and not too thick. Examine the joint for comparative thickness and beware of loose corners or edge portions. When using the belt for the first time, run through a roughing stick to take out the temporary stiffness of the joint before placing on finer work.

A FLOWER POT STAND

Chas. L. Dacey, Irvington, N. J.

A course of study is the foundation upon which a teacher develops the fundamental knowledge he imparts to the boy. It should be the background for creative ideas. It is the prop upon which the new teacher leans while he is becoming established. Likewise, its daily routine and monotonous sameness, make it an irritant to the older instructor for the creation of a better product, and one of more interest to the boy, changing, as it were, with time and tide and the local need.

In Newark, we try to use it that way. A comparison of the various shops will show that while the same model may be used, each teacher of experience adds a touch of himself, a new line here, a different color scheme there, and a change in shape or size, (or) to compare it with the trade, a new body for the regular stock chassis.

Number 1 of the drawings is a flower pot stand as it appears in the course of study. It was decided in the class that the bent over foot was not as decorative as it might be, and that for the time spent in construction, and the material required, a far better line might be developed. Consequently number 2 was designed, requiring no more lumber, and less hazard of breakage, as well as a better balanced piece of furniture. The cross pieces were raised in keeping with the design as a whole.

Number 2 was satisfactory for some time. The boys were better pleased and a consensus of opinion decided it was a step in advance of number 1.

Then one day, after a new class had decided upon this problem, a shortage of 7/8" stock was discovered. Plenty of 1⅛"x1⅛" was on hand, but that would not do. So number 3 resulted, and with a variety of brackets (shown at the bottom of the drawing) and of finishes, the boys had a new problem, a new method of execution, and a new "period" if you will, and all were satisfied.

Number 4 which has a Chinese influence,. was most successful when painted black, with gold edged brackets. Number 3 is stained and finished in the usual way.

All mortises and tenons are ¼". They are ¾" long with a ¼" shoulder on the top only. The square feet on the bottom are cut from square stock slightly larger than the uprights and vary in thickness from ½" to 1¼" thick, according to the ideas of the builder. The little step which they form with the upright can be bevelled slightly.

Number 5 shows what can be done still further in the same direction. The last one among the group of brackets on the right, shows a Chippendale influence.

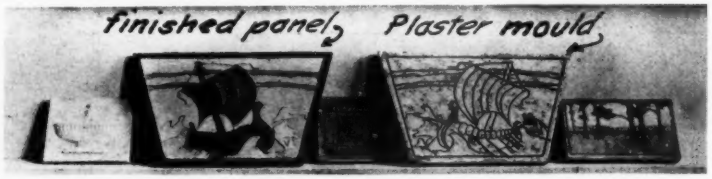


FIGURE 1.

Ornamental Concrete

H. P. Gerber, Department of Industrial Arts, Northern State Teachers' College, Aberdeen, S. D.

TREE OR FLOWER BOX

A box of the type shown here is easy to construct on account of the sloping sides which allow the core to be withdrawn with comparative ease. It is essential that a full size design be made.

Use of Standard Mouldings

A feature that makes this form somewhat easy to build lies in the fact that various combinations of standard moulding forms were used in creating the design. These mouldings can be purchased in white pine at any lumber yard by merely ordering by number. In some cases it is necessary to plane some of the mouldings slightly to work into the design well, but generally they can be used directly without alteration. The mouldings are always mitred at the corners, while the plain boards are butted and fastened with screws. Angle irons are used to hold the mouldings together at the corners.

Decorative Panels

The big job in connection with this project is the preparation of the decorative panels or tiles, as these are fastened to the inner edge of the mould they must be completed previous to casting the box.

In this particular project two-color cement tiles and two mosaic or Faience tile panels were used as is indicated by the photograph. As the construction of the color cement tile has already been given in a previous article

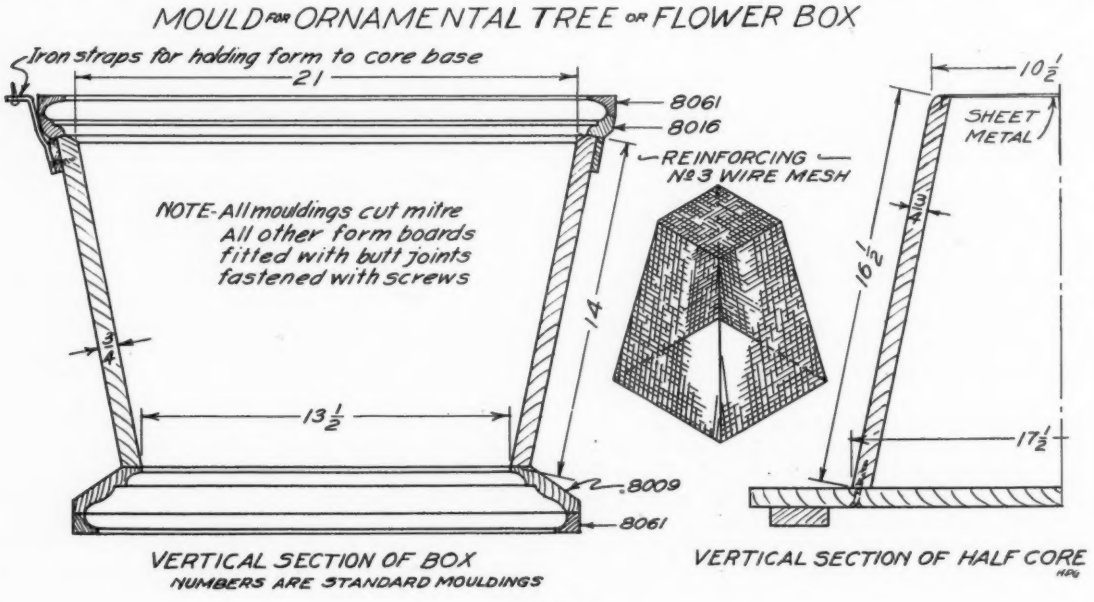


FIGURE 2.

FIGURE 3. CLOSE-UP OF BOX SHOWING PANELS OF INLAID FIRED TILES AND COLOR CEMENT TILES.

on "lawn seats," it will only be necessary to describe the latter form.

Faience Tile Panel

1. Roll out modeling clay on plate glass. Cut to an even thickness with light piano wire, held taut in a turning saw frame, and using two sticks of even thickness for guides.

2. Lightly mark the finished shape of panel on clay, and lay out the design by placing the Faience tile lightly on the clay and face up.

3. When the arrangement of shape and color is correct, invert each tile, and press slightly into the clay. Fig. 5.

4. With a knife blade and straight edge cut away clay to form the desired shape as previously marked.

5. Frame this shape with four sticks of equal height, held in place with pieces of clay as in Fig. 6.

6. Fill the area with concrete—one part cement to two parts screened sand.

7. Force a piece of No. 3 mesh into the top for reinforcing and strike level.

8. On the following day remove the forms and place the concrete panel in water for seasoning.

9. Clean surplus cement from the surface of the tiles so that their full shapes will show.

Fastening Panels to Form

When all necessary tiles and panels have been made, the outer form is assembled and the tiles are carefully fastened to the inside of the form by means of stove pipe wire, pushed through small drill holes in the form, and twisted up tightly on the outside.

If it is desired to give the tile an offset or paneled effect, continuous pieces of clay are placed under the edges of tile, and after the tile has been pressed down to the proper depth, the clay is beveled with a knife blade or the flat edge of a screw driver. Then it is wired in place.

FIGURE 4. ENTRANCE FOR WHICH BOXES WERE DESIGNED.

Reinforcing

The form is now inverted and fastened to the floor board which holds the core. Reinforcing is made in basket form by connecting four pieces of equal size and shape. The square bottom piece is left out until the form is nearly filled with concrete.

The reinforcing is carefully placed between the tiles and the core.

A quaky mixture of one part atlas or similar white cement to two parts screened sand is gradually filled in; poking it down with sticks and jarring the form in order to force it into every curve and corner.

If a drain hole is desired in the bottom, a piece of broom handle or dowel is set in position, and held until the square piece of reinforcing is pressed into place, and all surplus cement has been struck off.

Removing Forms

On the following day or in two days the core is first removed. Then the four outer sides are unscrewed and

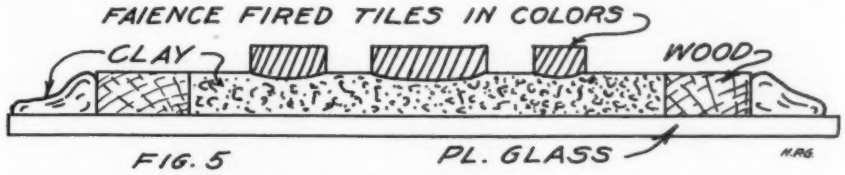


FIG. 5

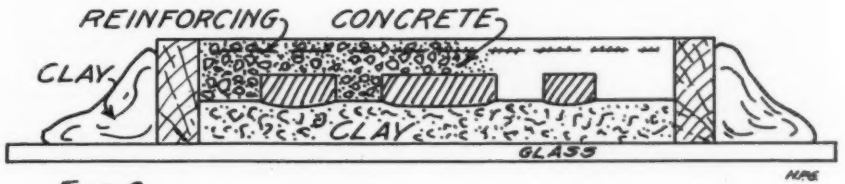


FIG. 6.

carefully removed, after cutting the stove pipe wire that holds the tiles in place.

Place wet burlap around the box to harden the concrete.

In a week or two any rough edges or bad spots may be smoothed down with a carborundum brick and water.

In this problem petroma was used to produce the ship tile shown in Figure 1. Colors such as blues and reds do not photograph well, but in this design nine shades and colors besides white were used. The result is beautiful and permanent.

THE LITHOGRAPHIC CLASS IN ROCHESTER

George Cullen

Of interest to school authorities all over the country is the course in lithography which is being given at Madison Junior High School, Rochester, N. Y., as part of the vocational program of the school system. The course has not been established long enough to measure definitely its true value. Suffice it to say that it is succeeding as part of the public school program where it failed as a private school course. This is particularly significant when it is considered that lithography is one of the most difficult of the trades, requiring unusual talent and patience.

The course was originally started less than four years ago, as part of the night school program at Rochester Mechanics Institute. Employing lithographers at that time got together and decided to establish the course as an aid in developing competent lithographic workers. They purchased the necessary equipment, including stones, proof presses for both stone and offset processes, transfer frames, drawing materials, in fact all working materials needed by the students.

During the first few months the course seemed doomed to failure. Very few men could be induced to take the instruction, for which they were charged a nominal fee. Finally the local authorities were prevailed upon and the course was introduced in the Madison junior high school as part of the vocational education program. As such, the course was given free of charge, but was open only to boys of school age. The length of the course was set at two years, the instruction covering all phases of lithography up to actual press work. The lithographers presented all the equipment they had purchased to the school.

From the beginning the course attracted attention and dozens of boys applied for enrollment. While the course is scarcely yet out of the experimental stage, it has already accomplished its primary object, namely, to arouse interest in lithography. During the term just ended, 122 boys took the course. Last term there were 130 in the class. In all several hundred boys have been interested in lithography since the course was inaugurated, although but eighteen have actually been placed in lithographic plants in Rochester. The students range in age from 14 to 18 years.

In the first year the students are given a history of lithography with special emphasis on its development in this country and the important part it plays in advertising. Exercises are then given in drawing on paper and on stone. Polishing, preparing, and lavering of stone are taught and instruction is given in the use of materials like emery, flint, French sand, schumacher fabric, pumice stone, snakestone, and American stone.

Art work is combined closely with free-hand drawing, water color painting, and pen work on stone, zinc, and paper. The remainder of the instruction has to do with stippling, crayon work, and engraving on gelatine, and the picking and selecting of colors in connection with three, four, five, and six color jobs. At that stage in the instruction, color harmony is taught on the basis of three primary colors and the students are impressed with the value of color in advertising,

Boys who do not display a liking or talent for drawing, are instructed in doing proofing on the hand press for

CLASS IN LITHOGRAPH AT THE MADISON JUNIOR HIGH SCHOOL, ROCHESTER, N. Y.
KARL M. LEUSCHNER, INSTRUCTOR, STANDING IN REAR.

stone as well as on the offset press, from one color up to six.

In the second year the students are introduced to the elementary and the general phases of chemistry as applied to the lithographic industry. The composition of the various inks, stones, and plates is explained, as well as the uses of the various acids and other chemical ingredients. Transferring is the final subject taken up. The students, having by this time become acquainted with the elementary stages of the trade, are given fairly thorough instruction in the art of transferring.

When the boys have completed the course, they are given certificates to show that they have a working knowledge of the fundamentals of lithography. Those students who have displayed sufficient talent and a desire to remain in the trade are given every opportunity to satisfy their ambition by the local lithographic companies. Before their graduation, the instructor usually has several requests from the various plants for boys, and he uses his influence in getting them positions which he thinks they can fill to satisfaction.

The course has already proved itself well worth the investment in money and time which have been put into it, in the opinion of Karl M. Leuschner, the instructor. Not only is it arousing interest among the boys in lithography, which is bound to react favorably for the industry, but it has enabled many boys to find their ideal occupation. And because he is an artist at heart, this latter and more altruistic phase of the course appeals to Mr. Leuschner just as much as the practical side of it.

"I have had several boys who before coming into my class were the disappointment of their parents and teachers," he said. "They would take no interest in their studies and the various vocational courses which they tried had no appeal to them. Finally they landed in my class and a complete change took place. They seemed to have found the work which interested them at last. Invariably they turned out to be my best pupils. I had one of them in my class during the term just ended. He displayed considerable native ability as an artist and I think he will make a name for himself in the lithographic trade. Who knows but what these restless boys, who finally found an interest in lithography, will in later years be outstanding geniuses in the trade?"

"Because of the youth of the students, not much can be expected of them. But I believe the value of this course lies not in the immediate results, but in the interest we are arousing in the trade and the background we are giving the students with which to enter the industry. We are turning out boys who will be better lithographers in later years."

PLANE SHARPENING

Oliver A. Barrick, Lock Haven, Pa.

The plane is a variation of the chisel. It has been developed to produce a smooth surface by cutting with a blade held rigidly at an angle of about 36°. Chisel and plane blades are sharpened in the same manner.

There are many kinds of planes, of various sizes and shapes, and for many different uses. The student of wood working in school shops will probably use only the block plane, the matching plane, and the fore plane, until he is well advanced in his work.

The block plane in common use is about 6" long, and is intended for use in one hand only, generally on small work. It was originally intended for planing end-grain, but is frequently used for planing side-grain, when one hand is needed to hold the piece. Block planes may be obtained in lengths from 3½" to 8".

If the operation of planing seems to require both hands to manipulate the plane, the block plane should be laid aside, and the fore plane used. The latter is operated by the use of both hands, and is intended to smooth large flat surfaces. It has a knob at the front end on which the left hand rests to assist the right hand in pushing and guiding the plane. Fore planes may be obtained in sizes from 18" to 20".

In sharpening, the plane blade should first be ground to an angle of about twenty degrees. This should be done on a grindstone if possible. An emery wheel may be used, if care is taken to prevent the blade from getting hot. The pressure against the stone must not be great, and the blade should be dipped frequently in cold water.

In grinding, it is important to keep the same bevel across the blade, to keep the cutting edge straight and also square with the edges. There is a tendency to leave a blade higher in the middle than at the edges. This will make the plane cut "hollow" and can be avoided by using a try square frequently during the grinding process. Fig. 1.

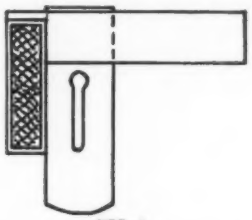


FIG. 1.

No grinding should be done on the flat side of the blade.

After the blade is ground, it should be given a keen edge by rubbing on an oil stone. The correct angle for whetting is 25°. This will give a keen edge to the blade, and will make it possible to whet it several times to one grinding. This will become apparent by consideration of Fig. 2.

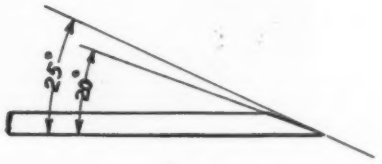


FIG. 2.

The stone should have several drops of oil at the place where the blade is to be rubbed, or else the pores of the stone will become filled with small particles of steel, which will interfere with the whetting.

A rotary motion should be used in whetting, and the blade should be held so that its direction is at right angles with the sides of the stone, as in Fig. 3. If desired, the

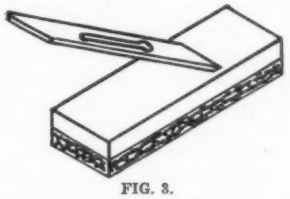


FIG. 3.

blade may be held at an angle to the sides of the stone. This angle should not be less than 45°, or the wear on the stone will cause it to become hollow. Care should be taken to keep the bevel of the blade flat.

The whetting process is likely to cause a fine wire edge to turn up on the flat side of the blade. This may

be removed by whetting the flat side of the blade. Care should be taken to hold the blade flat, as there must be no bevel on this side. It may be necessary to reverse the whetting in this way several times until the wire edge is removed.

The last operation in the sharpening process is the stropping. The blade should be drawn over a piece of leather several times on each side, keeping it at the bevel at which the whetting was done on the one side, and perfectly flat on the other. This should be repeated until the tool is sharp.

The test for sharpness is to run the tip of the thumb lightly across the sharpened edge. If the blade is sharp, it will catch in the flesh, and score the skin. If the blade is not sharp, the thumb will slide easily across it. This indicates that more stropping, or perhaps more whetting, is necessary.

How Shall We Mill It?

Typical Ways of Handling Various Milling Jobs—II

Howard Rowland

5. Square Fixture Milling

While not frequently employed, sometimes the nature of the parts make it desirable to have a fixture as shown in Fig. 5. This is a special adaptation of reciprocating milling and as may be seen, the work moves in a square path past the cutter, thus considerably reducing the idle time giving practically continuous milling. The operator loads the fixture farthest from the cutter while the other pieces are being milled.

6. Rotary or Continuous Milling

Continuous milling with no appreciable lost time cutting air is shown in Fig. 6. This method is used where the pieces can be placed close together. While the work rotates in one direction, the operator simply has to load and unload the part of the fixture furthest from the cutter. While milling, frequently the capacity of the operator to remove and load is the limiting factor in production, although this is not always the case. With this type of milling it is important to see that the method of gripping the piece is carefully considered. Sometimes this is accomplished by an automatic clamping device or by the individual cam clamping device for each piece as shown in this particular case. This shows the use of a standard power feed circular milling attachment mounted on the table of a standard vertical milling machine. The holding device is the only special part of the entire equipment.

7. Index Base Method

This method of continuous milling is usually found in connection with automatic millers of the fixed bed type although frequently it is found on the knee and column type machine. An index base is mounted on the table of

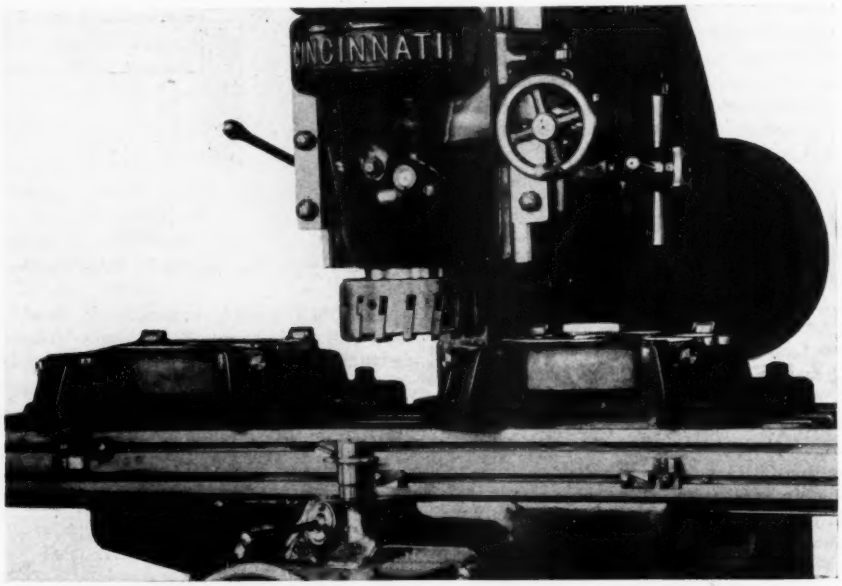


FIGURE 4B. RECIPROCATING MILLING ON A VERTICAL TYPE MACHINE. MACHINE: No. 4 Vertical, removing $\frac{1}{8}$" stock. PART: Flywheel housing. CUTTERS: 1—10½" diameter face mill. OPERATION: Mill cylinder face. MATERIAL: Cast iron. PRODUCTION: 36 pieces per hour. TIME PER PIECE: 1.45 minutes.

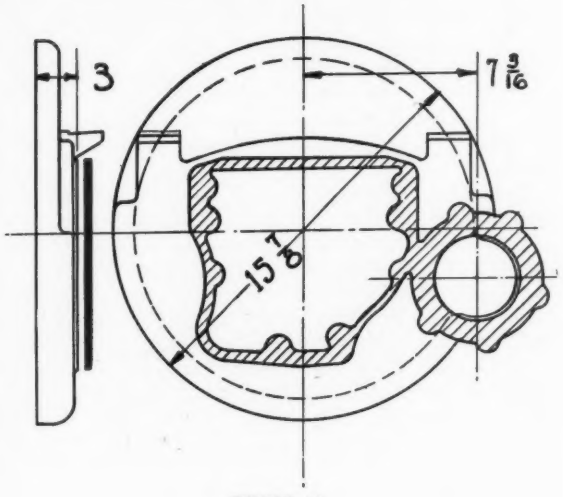
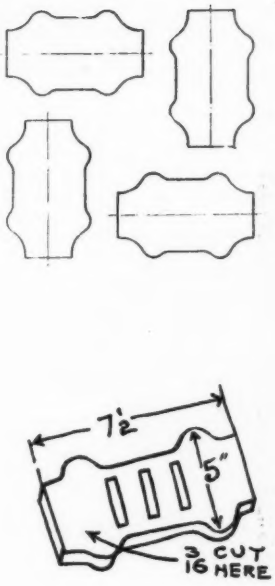
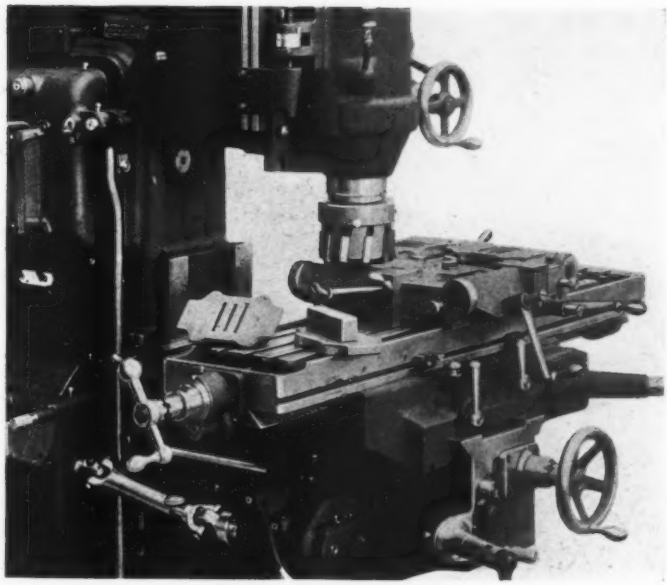


FIGURE 4C.





(LEFT) FIGURE 5A. (RIGHT) FIGURE 5. SQUARE FIXTURE MILLING.
MACHINE: No. 2 Vertical H.P., removing $\frac{1}{16}$" stock. PART: Sleeve valves. CUTTERS: 6" inserted blade, face mill. OPERATION: Mill bottom. MATERIAL: Cast iron. SPEED: 45 R.P.M. TIME PER PIECE: 1.1. FEED: 9¾.

the machine. Fixtures are mounted at each end of the swiveling table as shown in Fig. 7. While the pieces or piece in one holding fixture are being milled, the operator chucks fresh pieces in the other fixture at his end of the index bar. The machine automatically reverses, returns and stops and the operator then indexes the fixture 180° (this is frequently done automatically instead of by hand), to bring the newly chucked pieces in position for milling. The table is then automatically rapidly advanced, automatically tripping into the proper feed rate just before the work comes into contact with the cutters.

This makes the process continuous. The operator need not leave his position and the chucking is always done at the end of the table farthest removed from the cutters, thereby insuring a very desirable degree of safety. The operator is saved many fatiguing hand movements, does not move from his one position and is able to load and unload the work from convenient platforms or conveyors which usually are found to be of the same height as the machine table.

Attention is called in this illustration to the special cutter heads. This is a standard machine which ordinarily has two heads, one on each side of the piece but in this particular case, a third vertical spindle has been added to handle the pad on the top of the piece as indicated. Thus at one pass of the cutters the top, bottom and side pads are all finished.

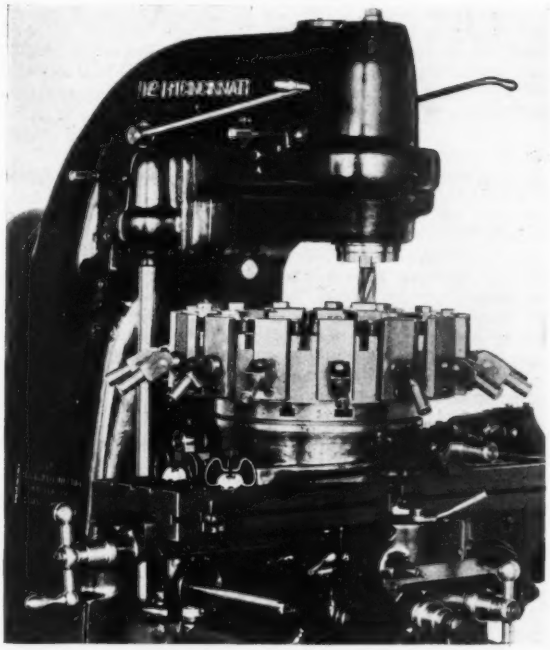


FIGURE 6. ROTARY OR CONTINUOUS MILLING.
MACHINE: No. 1 M Vertical with ¾ to 30 feed gears, removing $\frac{1}{16}$" stock. PART: Magnet clamp. CUTTERS: 1½" diameter spiral end mill. OPERATION: Mill face of main boss. MATERIAL: Brass. TIME PER PIECE: .078 min.

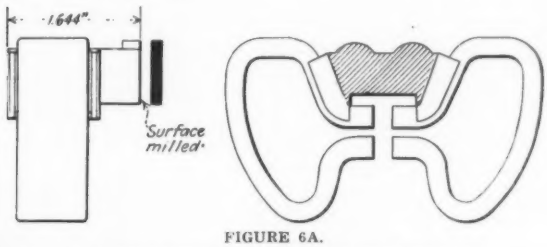


FIGURE 6A.

EAGERNESS OF WORKER TO LEARN

"Eagerness of the individual worker for his own development through further education has been increasing constantly through the last few years," said Richard Lansburgh, of the Pennsylvania Department of Labor and Industry, in an address before the National Education Association. "This is true because time has allowed individual workers to see the results which have been achieved by others through additional education along the specific lines of their interests," continued Mr. Lansburgh.

"However, there are certain influences working to dampen the ardor of the worker to increase his knowledge.

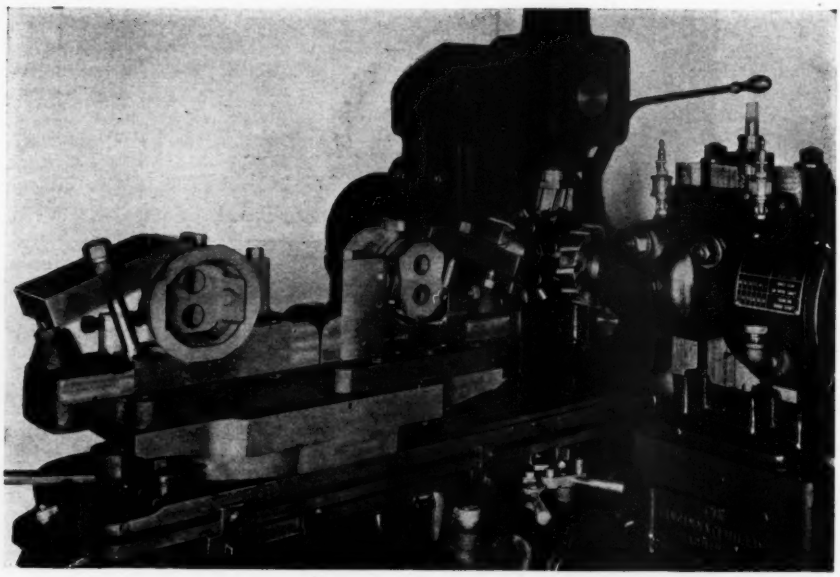


FIGURE 7.

INDEX BASE METHOD.

MACHINE: 24" Auto duplex, removing ⅛" stock. PART: CYLINDER block, No. 96939. CUTTERS: 1—7½" diameter shell end mill, 1—5" diameter shell end mill, and 1—3" diameter shell end mill. MATERIAL: Cast iron. TIME PER PIECE: 1.45 min. FEED: 6.4" per min.

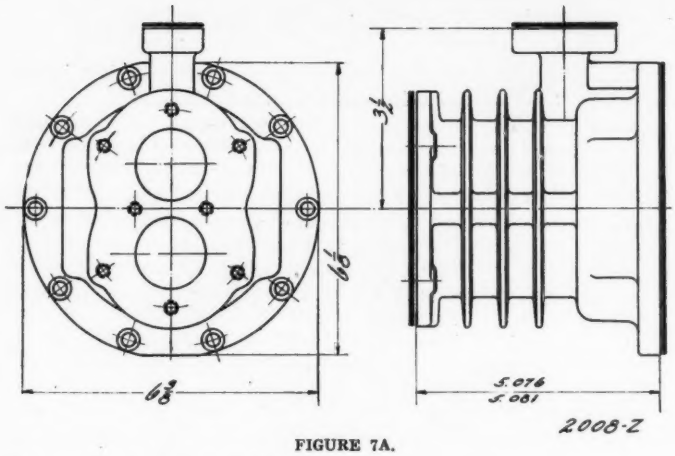


FIGURE 7A.

One occurs when an individual employer sponsors further education of a group of workers and then does not recognize their additional value to him resulting from such education. This makes for dissatisfaction in the individual and tends to retard the progress of other workers who are told by those affected that additional specific education does not necessarily bring results. Therefore, educational programs, worked out in cooperation with individual employers must never be over-sold to the workers.

"In commercial education the increase in the teaching of accountancy has led to some difficulties because sufficient accounting positions for those who qualify are not available. This has caused many trained men and women to remain on strictly bookkeeping work and to spend their additional efforts and their money without corresponding return.

"This problem of office workers has become acute in recent years through sudden increase in compensation to the skilled tradesmen, whose increased wages have ordinarily not been the result of any educational work.

"The opportunities afforded to skilled tradesmen in this generation are such that an ever increasing amount of educational effort must be directed toward replacing, through our educational system, the old-time apprentice who, because of present social and industrial conditions, has largely been eliminated from our social fabric.

"The worker has been somewhat over-sold on the possibilities that are his or hers through education for executive and managerial positions. Too often we have attempted to make executives by teaching executive problems, when the workers being taught have not had the fundamental ground work or experience to either absorb the instruction or, if able to absorb the instruction theoretically, to place it into practice.

"The attitude of the worker toward improving his skill combines an extreme eagerness to learn and to widen his abilities, with proper caution that he see the opportunity to reap financial benefits from his efforts."

A JOB SHEET IN ELECTRICITY
INSPECTING A THREE-PHASE INDUCTION MOTOR (SQUIRREL CAGE)

Operations Necessary to perform the Job.

Geo. A. Willoughby, Saginaw, Michigan

1. Remove the cap screws or nuts holding the heads, or ends.
2. Remove the front head. (The one opposite the pulley end.)
3. Remove the pulley end and rotor.
4. Place the heads and rotor where they will not fall or be injured in any way.
5. Put the cap screws or nuts back into the frame or in a place where they will not be lost.
6. Note carefully the construction of the rotor.
7. Note carefully the construction of the stator.
8. Count the number of coils in the winding.
9. Count the number of slots in the stator.
10. Note the number of wires provided for connecting to the line.
11. Study the winding sufficiently to be able to answer all of the questions at the end of this lesson.

Materials Required. Three-phase induction motor (squirrel cage type), paper and pencil for recording data.

Tools Required. Wrench and screwdriver.

Description of Operations.

Three-phase induction motors such as illustrated in Fig. 1 are used very extensively for power purposes where three-phase current is available. Work on motors of this

kind is essential because of their importance. To work intelligently requires a knowledge of the general construction and arrangement of parts as well as the types of winding and various other points which should be gained at this time.

Removing the Heads and Rotor. The heads, or ends, of an induction motor frame are usually attached to the body of the frame with cap screws which can be removed with a wrench. The heads can then be removed with a screwdriver. The pulley end head together with the pulley

FIG. 1. THREE PHASE MOTOR.

and rotor can be removed intact without removing the pulley from the shaft. Care should be exercised when doing this to avoid injuring the motor in any way and the rotor should be handled carefully to avoid springing the shaft. This should be placed in a rack or in some other place where it is impossible for it to fall. The cap screws should be put back into the body or in a box so they will not be mislaid or lost.

Characteristics of the Rotor. The rotor will be found to consist of steel laminations on a shaft because this material will carry varying magnetism without getting hot. There is no visible winding on the rotor but copper bars pass through slots and are securely fastened at the ends to conducting rings which short circuit them. Any metal cylinder would revolve if placed in the position of the rotor but the power of the motor would be reduced to a great extent and the motor would probably get hot. Note that there is no direct connection between the rotor and the source of current or the winding on the stator.

The rotor is said to be of the squirrel cage type because the series of bars on the cylindrical piece present the appearance of a squirrel cage.

Characteristics of the Stator. The stator core will be found to be made up of annealed steel laminations assembled and placed in a frame. The slots will be found to contain insulating material and may be of the semi-enclosed or the open type. The open type slots are used on larger machines where the coils are form wound and taped and then pushed down into the slots and held in place by wedges. The stator, too, is of laminated soft steel because this material will carry magnetism produced by alternating current without heating.

Types of Windings. The stator windings consist of coils of magnet wire placed in the slots and suitably connected for the desired results. There are several different types of windings including (1) two-layer flat diamond mush coils; (2) two-layer diamond mush pulled coils; (3) diamond coils, one side per slot and (4) basket winding.

Two-layer windings with flat diamond mush coils are the most common in small motors. Mush coils differ from form wound coils in that they are not taped over their entire surface as those of the latter type which are forced as a whole into the slots of the stator. The ends of the coils of this type may be taped and pulled into shape after thev have been put into the slots. This will make the windings close fitting at the ends. When this type of winding has been used the lower side of the coil and the upper side of another will be in the same slot, all slots containing sides of two different coils. Thus the number of slots and the number of coils will be the same. Sometimes additional insulation is placed on the phase coils. Such a winding is illustrated in Fig. 2.

Two-layer diamond mush pulled coils are wound in layers but are not taped. They are insulated by pieces of treated cloth triangular in shape. These coils are pulled to shape before they are inserted into the slots and the ends will not fit together as tightly as those of flat diamond mush coils.

FIG. 2. MOTOR DISASSEMBLED SHOWING WINDING.

Diamond coils, one coil side per slot, may be used in which case there will be one-half as many coils as slots.

If the winding is of the basket type there will be one coil in each slot but the coils will not be diamond shape. If this type of winding had been used the number of slots spanned by a coil will be odd. That is, the coil pitch will be 1 and 4, 1 and 6, 1 and 8, 1 and 10, etc. The number of slots must be even for this type of winding.

Coil Pitch. The coil pitch is expressed as 1 and 4, 1 and 6, etc. This means that if the pitch is 1 and 6, one side of a coil will be in slot number 1 and the other side will be in slot number 6, another will be in slots 2 and 7, another in slots 3 and 8, etc. The number of slots spanned by a coil is the number included between the sides of the coil counting the first side as one. Thus if a coil is in 1 and 6 the span is 5, if it is in slots 1 and 8 the span is 7; etc.

Questions

1. How can the heads and rotor be removed from the body of an induction motor frame?
2. Of what does the rotor consist?
3. Where does this type of motor get its name "squirrel cage"?
4. Why are the rotor and stator made of laminated soft steel?
5. What is the difference between an open slot and a semi-enclosed slot?
6. What type of slots were in the motor you inspected?
7. Of what does the stator winding consist?
8. Name four common types of windings?
9. What is meant by a "mush" coil?
10. What is meant by a two-layer flat diamond mush coil?
11. How does a two-layer diamond mush pulled coil winding differ from a two-layer diamond mush coil winding?
12. How many slots are there in the motor you inspected?
13. How many coils are there?
14. Are there two coil sides per slot or only one?
15. What type of winding did you find on the motor you inspected?
16. What is the pitch of the coils in the motor.
17. How many wires are provided for connecting to the line?
18. List points of importance relative to the motor such as the manner in which the various coil connections are made, the way they are attached to the winding, etc.
19. Have the phase coils special insulation?
20. Are the coils mush or form wound?
21. Are the coils of the pulled type?
22. Are the coils tape all over?
23. Are the ends taped?
24. Are triangular pieces of threaded cloth used between coils?
25. Do you think a basket winding could be put on this motor?

NOW, ARE THERE ANY QUESTIONS?

Refinishing Plaster Casts

Q. 621. Will you please send me information on how to clean statuary or plaster casts?—W. E. H.

A. If the casts to be cleaned have the Caproni ivory finish, or some other paint finish to harden the surface, they can probably be washed.

They should first be dusted by blowing off the dust, and then they may be washed as follows: First, wet the piece with lukewarm water, then dip a wet sponge or bristle brush into dry "Gibson's mopping powder" (manufactured by the Cudahy Soap Co.) and rub the cast all over quickly. After this rinse the piece with fresh water, not allowing the powder to stay on the piece any longer than is necessary.

If washing is not sufficient, they may be painted. For this purpose purchase flat white paint of the quality used for interior work and dilute a little with turpentine to avoid gloss. If the cream color is desired, add to the flat white the necessary colors to make the shade desired. Then with this paint, give the casts one coat each 24 hours until they are in satisfactory condition.

If the casts to be cleaned are of plain plaster without any surface or paint finish, they cannot be washed. After dusting as above, they should be given a coat of thin white shellac, which if bought in liquid form should be diluted about one-half with alcohol. Let this coat of sizing dry for about four hours, and then the casts may be painted as above.—P. P. Caproni, Boston, Mass.

Hose Reel

Q. 622. Can you supply me with the drawings for a hose reel?—A. B.

A. The Editor of the Magazine will be glad to transmit a set of drawings submitted by any reader. If the drawing is suitable for reproduction, it will be published and paid for at space rates.

Smalts for Signs

Q. 623. Can you tell me how the effect of a surface pebbled with a black crystal can be obtained on a sign?

A. The pebbled effect on signs is produced by smalting—that is, by covering the surface of the sign with smalts.

Originally smalts, or osmalto, was a pulverized glass manufactured in Italy and Austria. It was a by-product reclaimed from the waste in the manufacture of bottles and other glass articles. Sea sand was and still is used as smalt, to a certain extent.

Smalts are now manufactured in the United States by secret processes and are usually made of glass. Binney & Smith Co., 41 East 42nd St., New York, N. Y., are perhaps the largest producers.

The method of application is simple. The sign is coated with a lead paint and is given a coat or two of paint of the color of the smalts. The smalts are dusted over the surface while the paint is still fresh. The sign is then allowed to stand for 24 hours and the loose surface smalts are dusted off.

Smalts can be obtained in black, scarlet, blue, green, blue-black, and other common colors.

Achievement Tests in Industrial Arts

Q. 619: I should like to have a list of achievement tests for industrial arts subjects.—H. H. R.

A.: The following tests will be found helpful for industrial arts and vocational classes:

MacQuarrie's Test for Mechanical Ability, $1.50, Issued by T. W. MacQuarrie, University of Southern California, Los Angeles; Stenquist's Measurements of Mechanical Ability, Contributions to Education No. 130, Teachers College, Columbia University, New York; Partrick Industrial Art Tests for Grades Seven to Nine, C. D. Partrick, 44 Vista Ave., Elizabeth, N. J.; Sunbury General Shop Accomplishment Test for Grades Eight and Nine, Wayne E. Steiner, Sunbury, Pa.; Hunter Tests for Machine Shop Work and Woodwork, Wm. L. Hunter, 50 Morningside Drive, New York City; Thurstone Vocational Guidance Tests, L. L. Thurstone, World Book Co., Yonkers, N. Y.; Army Mental Tests, Yoakum and Yerkes, Henry Holt Co., New York City; Wardner's Test for Knowledge of Tools, C. A. Wardner, Jackson, Mich.

SHOP TEACHER'S CALENDAR

Timely Tasks for October

Shop Management.—See that there are no shortages of supplies, materials, or texts. Check up on the students to see how they fit into courses; adjust misfits.

Be careful to see that all classes are started and closed promptly. There should be no waste of time as each wasted hour means a loss through the entire year.

Evening Classes.—Announce evening industrial school program and arrange for extensive advertising campaign in industrial plants. Issue bulletin giving information about the evening courses. Prepare in advance for registration and enrollment of students.

The Courses.—Check up the related work, particularly machine information and safety instruction to develop with the shop practice.

If climate permits, plan outdoor problems and visits to industries.

Arrange for addresses of industrial leaders to shop classes, and if possible, to the entire school.

Professional Work.—Check self on the development of plans for professional reading and study.

School and Community Spirit.—Check community and school enterprises for possible cooperation of shop department.

A METHOD FOR TESTING THE HARDNESS OF GLUE JOINTS

Woodworkers have found that glues are usually more abrasive than wood, and that tools dull rather quickly in the machining of glued products. A manufacturer in selecting a glue for his own requirements should choose a glue which is the least abrasive of those having the qualities he desires.

The U. S. Forest Products Laboratory of Madison, Wis., has issued a small pamphlet giving a method for testing the hardness of joints made with different glues.

A number of pieces of wood (preferably softwood) are glued together face to face, each individual joint being produced with one of the glues to be tested. After the laminated block has been allowed to condition for a week, one edge is cleaned of excess glue and squared up. The block is then run repeatedly over a jointer in such a way that each glue line passes over one spot in the cutter. The depths of the respective nicks caused by the hard glue lines are then a rough measure of the abrasive effect of the glues.

It is difficult to detect differences in the nicks by a mere visual inspection. A better means of comparison is afforded if a smoothly planed softwood board is run across the dull knives. In this case the nicks are the result of jointing a laminated block in which seventeen different varieties of commercial glues are used.

The Old Ones Are Best

"Now, James," said the joiner to his apprentice, "I am going out. I don't expect I shall be long, and you can be planing up that ten-by-eight beam till I come back."

But misfortune overtook the joiner. He slipped at the bottom of the street, sprained his ankle, and had to be taken home.

The next day he hobbled into his workshop and was confronted by an enormous pile of shavings. James was invisible.

"Jim!" he called.

"Hallo!" came a far-off cry.

"Where are you?"

"Down here, under the shavings."

"W-why—what are you up to?"

"Planing that beam up. You told me to keep at it till you came back; but if you'd kept away much longer there'd have been none left."

New plans that will interest your boys!

THESE Stanley Plans are complete. Each plan has a working drawing, a stock layout and a list of necessary materials and tools, as well as complete instructions for making the project.

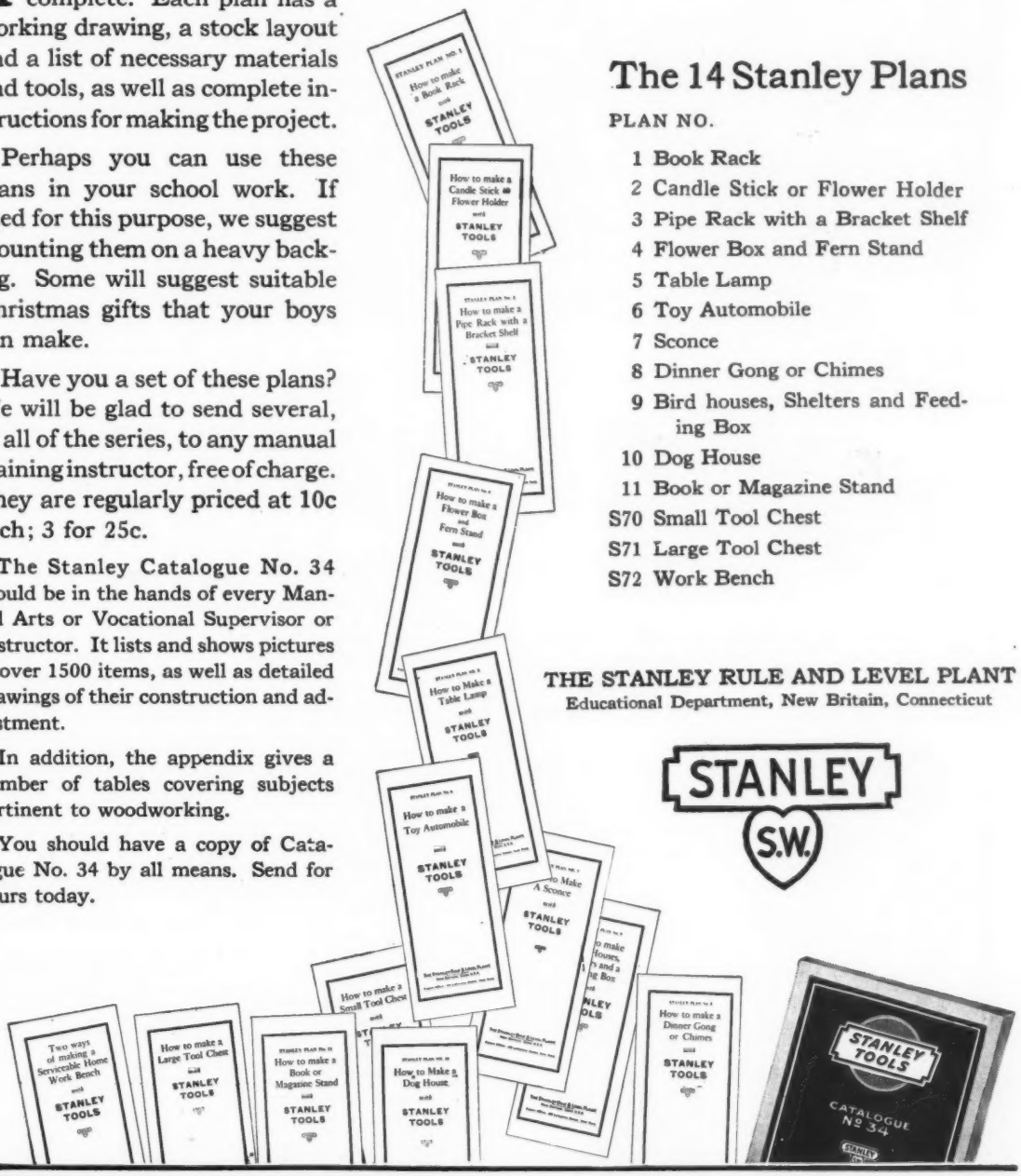
Perhaps you can use these plans in your school work. If used for this purpose, we suggest mounting them on a heavy backing. Some will suggest suitable Christmas gifts that your boys can make.

Have you a set of these plans? We will be glad to send several, or all of the series, to any manual training instructor, free of charge. They are regularly priced at 10c each; 3 for 25c.

The Stanley Catalogue No. 34 should be in the hands of every Manual Arts or Vocational Supervisor or Instructor. It lists and shows pictures of over 1500 items, as well as detailed drawings of their construction and adjustment.

In addition, the appendix gives a number of tables covering subjects pertinent to woodworking.

You should have a copy of Catalogue No. 34 by all means. Send for yours today.


How to make a Book Rack
How to make a Candle Stick or Flower Holder
How to make a Pipe Rack with a Bracket Shelf
How to make a Flower Box and Fern Stand
How to Make a Table Lamp
How to make a Toy Automobile
How to make a Small Tool Chest
How to make a Large Tool Chest
How to make a Book or Magazine Stand
How to Make a Dog House
How to make a Dinner Gong or Chimes
STANLEY TOOLS
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1 Book Rack
2 Candle Stick or Flower Holder
3 Pipe Rack with a Bracket Shelf
4 Flower Box and Fern Stand
5 Table Lamp
6 Toy Automobile
7 Sconce
8 Dinner Gong or Chimes
9 Bird houses, Shelters and Feeding Box
10 Dog House
11 Book or Magazine Stand
S70 Small Tool Chest
S71 Large Tool Chest
S72 Work Bench

THE STANLEY RULE AND LEVEL PLANT
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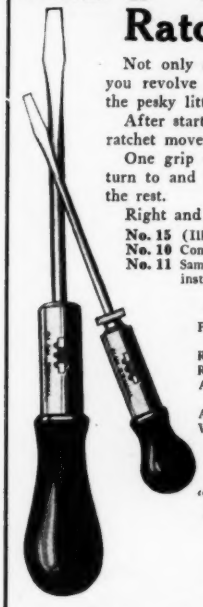
Good Schools deserve "YANKEE" TOOLS

While hand holds driver steady, you start screw with thumb-turn on blade.

Starting small wobbly screws is easy

with a "YANKEE" No. 15 Ratched Screw-Driver



Not only easy, but fast. With thumb and forefinger you revolve knurled washer on blade and quickly start the pesky little screw.

After starting by thumb turn, you send screw home by ratchet movement.

One grip on the handle is all that is needed. Then turn to and fro, and the smooth "Yankee" Ratchet does the rest.

Right and left ratchet; and rigid.

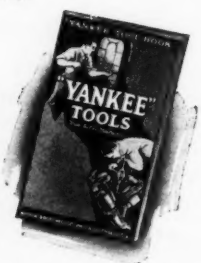
No. 15 (Illustrated) comes with 2, 3, 4, 5, 6, and 8 in. blades.
No. 10 Comes with 2, 3, 4, 5, 6, 8, 10, and 12 in. blades.
No. 11 Same as No. 10, except that Ratchet Shifter moves across instead of parallel with blade.

Some other "Yankee" Tools

Plain and Spiral Screw-drivers
Ratchet Bit Braces
Ratchet Hand Drills
Automatic Feed Bench Drills
Automatic Push Drills
Vises, Removable Base

Dealers everywhere sell "Yankee" Tools

"Yankee" on the tool you buy means the utmost in quality, efficiency and durability.



Every school should have the "Yankee" Tool Book It tells all about the famous "Yankee" Tools. Write for your copy today.

NORTH BROS. MFG. CO., Philadelphia, U. S. A.

"YANKEE" TOOLS

Make Better Mechanics

NEW BOOKS

Pewter Design and Construction

By William H. Varnum. Cloth quarto, 148 pages. Price, $3.50. The Bruce Publishing Co., Milwaukee, Wis.

The ancient craft of pewter is explained in this book and adapted to use as a craft subject in schools and colleges. The author has been a prominent worker in metals and a teacher of design for many years, and has found that pewter is a metal quickly adapted to use by young craftsmen and amateur art metal workers, and that it can be used with great success in making numerous articles of artistic value and every day utility in the home. The relatively low cost of pewter metal or Britannia, as it is commonly designated at the present time, makes pitchers, candlesticks, sugar bowls, plates and innumerable small articles for home use readily within the reach of the average family purse. If these are well-designed and carefully made, they have all the value of ancient pewter and they are far more interesting and useful than similar articles made of silver.

The present book opens with an historical review of pewter and pewter design and in a series of chapters describes a particular method of designing for pewter and in detail recounts all of the processes of shaping and casting, turning and finishing articles made of pewter. Additional chapters discuss surface enrichment, the application of pewter, and the lighting fixtures. The book is beautifully illustrated with ancient as well as numbers of modern examples of pewter ware which are especially adapted to present-day use in the home.

Job Sheets in Home Mechanics

Set No. 2. By F. E. Tustison. Price, $0.52. Published by the Bruce Publishing Co., Milwaukee, Wis.

The present set of job sheets is a continuation of job sheets in home mechanics previously prepared by the same author, and represents additions selected from a rather large list of jobs carried on in his classes.

Among the jobs listed and described are re-caning a hand-caned panel for a chair, making a form and casting a concrete flower box, whole-soling and heeling a shoe, reading a water, gas or electric meter, attaching hose couplings and hose menders to a garden hose, repairing a hole in a plastered wall, making a frame and heating elements for an electric toaster, and re-seating a ball-cock in a closet tank.

The practical nature of the jobs and the teaching of new skills have been the determining factors in the selection of the jobs, and the content of the material is such that the average home mechanics shop can carry on the problems with a minimum amount of equipment. The material should prove helpful to shop teachers in offering additional work along this line. It will prove interesting to boys in shop classes who are interested in practical jobs that hold the attention and increase mechanical skill.

Problems in Blueprint Reading

By Drew W. Castle. Edited by R. W. Selvidge. Paper, 87 pages. Price, $1.44. Published by The Manual Arts Press, Peoria, Ill.

This book is the latest addition to the Selvidge Series of Instruction Manuals. It follows the plan of providing the essential information on mechanical drawing in a series of instruction or information sheets and of requiring the student to apply the knowledge so gained to a series of job sheets or problems. The present course is simple, carefully graded, and quite ample for the prospective machine shop operative.

Social Arithmetic

Book One. Frank M. McMurry and C. B. Benson. Cloth, 345 pages. The Macmillan Co., New York.

This text for the middle grades is based entirely on the need and use of numbers in the home, the community, and on the farm.

Geometry of Engineering Drawing

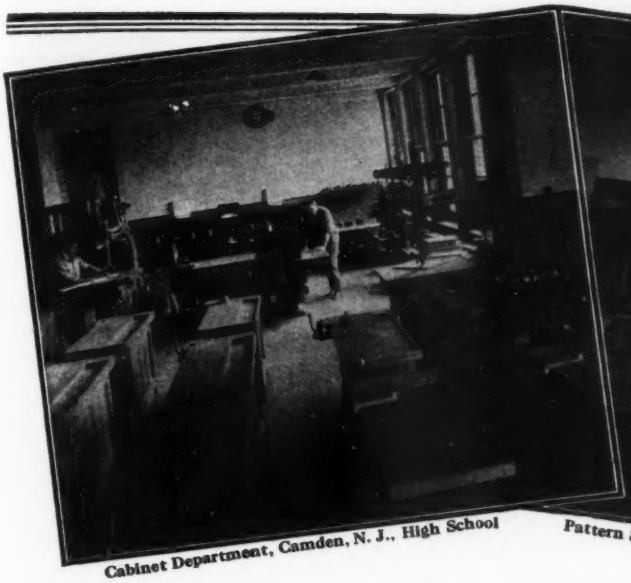
By Geo. J. Hood. Cloth, octavo, 290 pages; price, $2.50. McGraw-Hill Book Co., New York, N. Y.

This advanced text approaches the mathematical problems of engineering drawing entirely from the standpoint of the draftsman and practical engineer. It is as its subtitle indicates, a "descriptive geometry by the direct method" in which theorics and problems are developed not from the standpoint of pure theory but of practical, widely used principles traced back to their theoretic origins. The subject is introduced through the study of principal views, auxiliary views, and oblique views. The analysis of structures, straight and curved lines, and planes is followed by chapters on intersection and development of surfaces, single curved surfaces, warped surfaces, and double curved surfaces. Perspective and projection complete the book. The problems occupy an additional hundred pages of small print, and require both mathematical solutions and drawings.

Painting and Wood Finishing

By W. S. Lowndes. Cloth, 106 pages. The International Textbook Co., Scranton, Pa.

This book describes briefly and simply the materials and essential processes used in the painting and finishing of buildings. The author proceeds on the theory that the student should first become acquainted with simple outdoor painting, and then proceed as he acquires the skill and knowledge of his trade to the more difficult and varied kinds of interior painting and wood finishing. Valuable features of the book are formulas for paints for various purposes. Considering its brevity the book is crammed with practical information; it will be found valuable in all school wood working and finishing shops.



Cabinet Department, Camden, N. J., High School

Pattern Shop

The Importance of Correct Methods of Shop Practice

Camden, N. J. High School

A teacher who strives for correct methods of shop practice knows he can reach that ideal only by the use of real industrial machines. Such a man is Mr. Harley E. Smith, Instructor in Woodworking in the Camden High School, Camden, N. J.

MR. HARLEY E. SMITH
Instructor of Manual Training

The two illustrations at the top show sections of the Pattern Shop and the Cabinet Department in this school and the following is a list of Yates-American machines in each.

CABINET DEPARTMENT	PATTERN SHOP
No. 5 Sander	No. 13 Pattern Maker's Lathe
36" Band Saw	10-12" Speed Lathes
Hollow Chisel Mortiser	36" Band Saw
Self-contained jig saw	No. 2 Surfacer
1 - Speed Lathe	12" Jointer
	No. 20 Universal Saw

The tools of school are the tools of life

YATES-AMERICAN MACHINE COMPANY

EDUCATIONAL DEPARTMENT

ROCHESTER, N. Y.

See the Point?

Some people think the point of a drill is the extreme tip of the cutting end!

Actually, that extreme tip is known as the "Dead Center"—while "The Point" is the *entire* cone-shaped surface at the cutting end. All that you see in the illustration above is "The Point."

This is only one of the many interesting and instructive definitions to be found in the Handbook for Drillers. In it every part of a twist drill is clearly and simply described—plus a great deal of useful information on grinding, cutting speeds, feeds and how to secure the best results when drilling in various metals.

Vocational Directors and Instructors are invited to ask for copies of the Handbook, in any reasonable quantities, for the use of their machine shop classes.

The CLEVELAND TWIST DRILL COMPANY CLEVELAND NEW YORK-CHICAGO-LONDON

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

Manufacturers of Carbon and Cle-Forge High Speed Drills for every purpose; "Mezzo" Super-Carbon Drills; Hand, Jobbers' and Shell Reamers; "Peerless" High Speed Reamers; "Paradox" Adjustable Reamers; "Quick-Set" Reamers "Spirex" Machine Taper Pin Reamers; Chucking Reamers for Turret Lathes; Counterbores; Countersinks; Sockets; End Mills; and the "Esy-Out" Screw Extractor.

MR. NELSON TO STOUT

Mr. Paul C. Nelson, for eight years a member of the faculty of the Racine, Wis., Vocational School, has been engaged as successor to Mr. R. A. McGee, at Stout Institute, who has taken up his new position at the University of Minnesota.

Mr. Nelson, who will have charge of the work in carpentry, elementary woodwork, and wood finishing, during his eight years in the Racine schools, taught classes in carpentry, woodwork, cabinet making, wood finishing, and architectural drafting. Besides his regular vocational and high school classes, he also conducted apprentice evening classes for men and boys engaged in trade work.

Mr. Nelson has had eighteen years' trade experience, consisting of cabinet making and carpentry as an apprentice and journeyman, millwork and stair-building as a foreman, and millwork and carpentry as a contractor and builder. His experience as a practical woodworker and carpenter make him exceptionally well qualified for the work at Stout.

In 1924 the State Board of Vocational Education appointed Mr. Nelson as chairman of a committee to formulate a course of study in cabinet making for the Wisconsin Vocational Schools. He served in the same capacity a year ago on a committee to formulate a course of study in carpentry.

PERSONAL NEWS NOTES

Miss Jessie W. Harris, director of vocational home economics in the Texas Department of Education for the past six years, resigned on September first, to accept the position of professor of home economics in the University of Tennessee. Miss Harris has been recognized as a leader in the field of home economics, and her removal from the State will be a distinct loss.

Miss Lillian Peek, who for seven years has been assistant director of vocational home economics, has been promoted to the position made vacant by the resignation of Miss Harris.

Miss Eloise Berry, who has been director of vocational home economics for the State of Florida, has been appointed assistant director of home economics of Texas, to fill the vacancy caused by the promotion of Miss Peek. Miss Berry is a graduate of the University of Texas and spent several years in the extension service of the A. and M. College. For four years she was in the home economics department of the University of Texas.

Mr. J. T. Reynolds has been elected instructor in industrial arts at El Paso, Tex.

Mr. Frederic Brown has been elected professor of architecture at the Rice Institute, Houston, Tex.

Mr. J. J. Sasser has been elected instructor in industrial arts at Victoria, Tex., for the ensuing year.

Mr. George Livingston has been appointed instructor in mechanical drawing in the Main Avenue High School, San Antonio, Tex.

Announcements of elections to home economics positions in Texas are as follows: Miss Edna Estes, Carrizo Springs; Miss Mary Porter, Cotulla, and Miss Bird Boswell, Dilley.

Appointments to agricultural shop work are: Mr. J. J. Bates, LaPryor; C. N. Jones, Frio, and Charles D. Parker, Dilley.

Mr. James J. Burke has been appointed to the position of supervisor of opportunity classes in vacation schools of New York City for the season of 1926.

Mr. Samuel Slade has been appointed director of vocational activities of New York City schools for a period of one year, beginning with August, 1926. Mr. R. G. Weyh and Mr. Maximilian Komow have been reassigned to the office of the director of vocational activities, New York City, for a period of one year, beginning with July, 1926.

Mr. F. T. Struck, formerly director of the Pennsylvania Bureau of Vocational Education, has accepted the position of head of the industrial teacher-training department in the Pennsylvania State College, State College, Pa.

CHILDREN'S ART MUSEUM

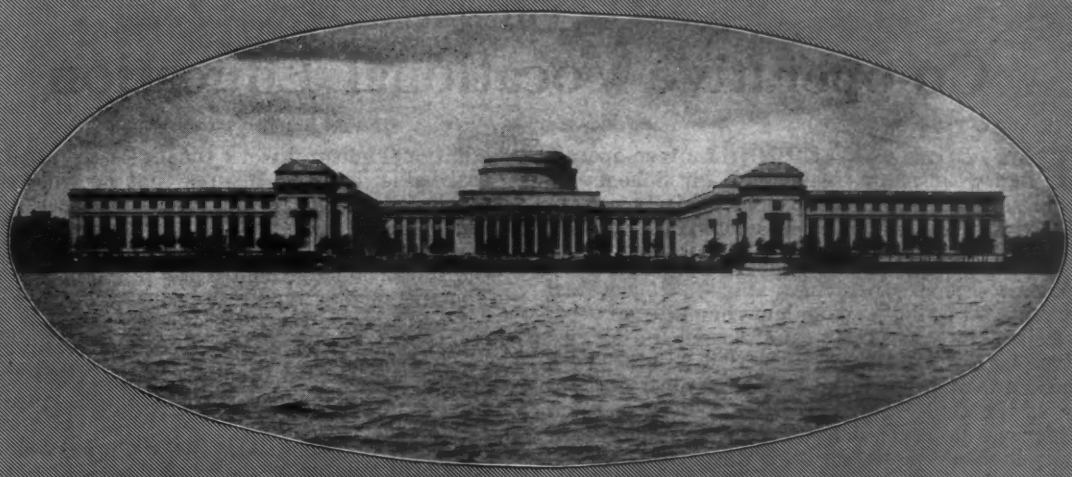
The first strictly children's art museum in the country has been established in the Liller School, at Colorado Springs, Colo. The museum is the result of three years of planning and preparation on the part of Prof. Richard Ernesti, director of art education in the schools.

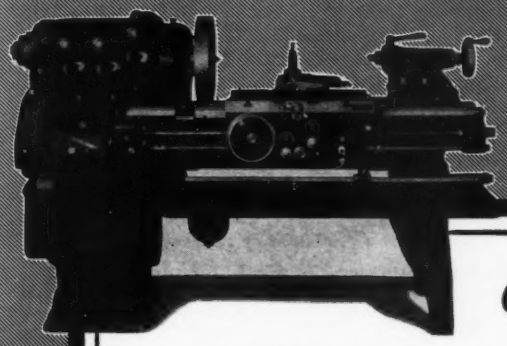
The building, which is well adapted for the purpose, has been set aside as a museum by the board of education. The museum is housed in a small unit of the Liller school, where the first work of the children in drawing, commercial design and handicrafts will be exhibited.

The building contains five rooms, together with a good-sized foyer on the main floor, which will be given over to the exhibits. In one room will be shown the handiwork of the advanced students, and in another section will be shown the work of the smaller children from the grades. There will be samples of the work in leather, cardboard and paper, manifold in design and conception. The foyer will hold the exhibition of the best drawings selected from the recent art exhibit in the auditorium.

The lower floor of the building is arranged for class purposes where gifted boys and girls may receive technical instruction after school hours and on Saturdays. Special courses will be offered for those with unusual talent, and there will also be courses for those not endowed with outstanding ability for creation.

It is planned to include loan exhibits in all forms of art and to obtain paintings of the famous masters for hanging from time to time. These will be exhibited at intervals as works of art to spur the pupils to greater achievements.





and now —

The Massachusetts Institute of Technology uses The

MONARCH Helical Geared Ball Bearing LATHE

as a part of their Metal Working Equipment.

The prestige of this Institute—the corner-stone of Massachusetts' enviable system of vocational education — attracts students from the four corners of the civilized world.

In choosing the equipment for these students, the directors of the Institute must base their choice upon equipment that will give students the greatest possible amount of experience.

We are proud of the selection of the MONARCH Engine Lathe as a part of the Institution's metal working equipment — proud that it has been selected solely upon its merit, after careful consideration, as the type of equipment necessary for the high degree of training which Massachusetts "Tech" gives to its students—a training which has been so creditably reflected on the Institution by its graduates.

We shall be glad to plan your vocational metal working shop. Give us a statement of your requirements and let our Free Engineering Advisory Service plan your shop, giving you an accurate estimate of the entire equipment cost. This service is gladly rendered without charge.

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The "Benton Harbor Plan" of

Co-operative Vocational Education

THE AMERICAN SCHOOL is now co-operating with many resident High Schools by supplying courses in vocational subjects not included in the curriculums of Local High Schools.

The teacher helps a student to select a correspondence course, giving valuable vocational guidance in so doing, examines the matèrial used, watches the instruction, and checks the service given by the AMERICAN SCHOOL to make sure that all work is up to the best High School standards. Studying may be done in a class room under the supervision of one of the regular High School teachers, but the student sends his examinations to the Correspondence School for corrections, comment, and help by the specialists in that vocational line. Local supervision justifies the High School in giving full credit for all such work toward graduation and a diploma.

The student may continue with the regular High School branches which not only give the additional cultural work that is of so great general value, but also insures that he will remain much longer than otherwise a member of his school group and enjoy the resulting social contacts and opportunities. Neither the student nor the school management enter into any contract. The instruction material and services are paid for as they are received, and the cost per pupil is less than for regular High School branches.

This simple plan produces some very remarkable results and solves some hertofore very difficult problems. Only the wealthiest of schools, even when aided by State and Federal funds, can afford the equipment and staff necessary to teach any large number of vocational branches. On the other hand, the AMERICAN SCHOOL offers excellent courses on practically all technical subjects. We invite the closest inspection of our Educational standards.

Some of the good that has resulted from this program is as follows:

1—Even a class of one in a vocational subject obtains high-grade instruction and service.

2—The work of the High School is multiplied and extended at a minimum of expense.

3—The student leaves High School later than he otherwise would and is far better prepared both as a citizen and as a worker.

4—The interest and backing of employers and the general public for the Public School System is greatly increased.

5—There is opportunity for valuable vocational guidance and much greater probability that a suitable course of training and occupation will be selected.

6—The whole plan is so flexible that it will fit into practically any kind of a school program.

7—A class of twenty may be studying twenty different trades under the supervision of a single teacher, who need have no special knowledge of any of these subjects. It is even possible to set aside a room for study with no direct supervision.

8—It is made to order for the continuation school work now common in so many states.

The AMERICAN SCHOOL requests the opportunity of making High School officials everywhere thoroughly acquainted with its co-operative vocational program. At your request we will gladly furnish complete information regarding the details of the "Benton Harbor Plan."

AMERICAN SCHOOL

58th Street and Drexel Avenue Chicago, Illinois

AMERICAN SCHOOL, Drexel Ave. and 58th St., Chicago:—

Please send me a copy of "Study of Benton Harbor Plan" by a disinterested educator.

.....

.....

CO-OPERATIVE VOCATIONAL DEPARTMENT. .....

NEWS AND NOTES

Manual Arts Building. The school board of Austin, Tex., has begun the erection of an industrial and manual training building to cost $71,000.

New Industrial Arts Building. An industrial arts building is under construction at Cuero, Tex. The building will be completed in time to add industrial arts subjects to the course this fall.

Prize Dresses. The parent-teachers' association of Lampasas, Tex., offered its annual prize for commencement dresses made by girls graduated from the local high school. The purpose is to encourage simplicity and good taste, and to further the spirit of democracy among the girls. In making the awards, general appearance of the dress, handiwork, combination of colors, appropriateness, and cost were taken into consideration.

Cooperative Industrial Exhibit. Visitors to the number of 2,000 were attracted to the Brackenridge high school, San Antonio, Tex., to inspect the cooperative exhibit arranged by the industrial education department and the local manufacturers' association. Cases and displays provided housing for 120 items of home manufacture and industry.

Art Students Design School Flag. An official school flag has been adopted by the Texas College of Industrial Arts at Denton, Tex. Students of the art department worked out a suitable design, which embodies the ideals and traditions of the College.

University to Build Art Museum. The University of Texas has received a gift of $150,000. The money will be used to build a fine arts museum to house an art collection valued at $500,000.

Mexico Revives Native Arts and Crafts. Mexico has taken steps toward the revival of native arts and crafts and will shortly purchase 700,000 pesos worth of American-made machinery for the proposed agricultural and mechanical schools. At present, four open-air art schools are in operation in the City of Mexico. Other communities are teaching craft work, using the ancient Indian designs.

Develop Responsibility Among Students. The Sidney Lanier high school at San Antonio, Tex., has conducted an experiment, under which students served one day as principal, shop teacher, mathematics instructor, etc. The purpose of the plan was to develop social responsibility among the student body.

Printing Trades Building. A printing trades building is under construction at Dallas, Tex. The building will house the printing branch of the local vocational school, which will have equipment valued at $40,000. Both day and evening courses will be offered.

Home Economics Cottage. A home economics demonstration cottage is under construction at Weslaco, Tex.

Study Vocational Departments. Dr. W. L. Bryan, of the University of Indiana, recently visited and studied the vocational departments of the Sidney Lanier high school and the senior school for negroes at San Antonio, Tex.

Trade School Addition. An addition to the state trade school at Putnam, Conn., is under construction. The present departments of the school will be expanded with the addition of new equipment and new instructors.

A feature of the new work will be a course in masonry, which will include a complete set of experiences in the masonry trade, together with the necessary related work. The work will cover such branches of the trade as masonry, brickwork, concrete construction, plastering, and stucco work.

Manual Training Course. A course in manual training has been added at the Gilson high school, Knoxville, Ill.

Vocational Work for Boys. The high school at Claude, Tex., will offer vocational work for boys during the next term. The total number of units is to be twenty-one and one-half.

Manual Arts Building. The school board of Albion, Neb., has awarded the contract for the erection of a manual arts building to be used for agriculture and manual training classes. It is a one-story brick building, and was planned by Architect George Grabe, of Columbus.

Vocational Work Has Commercial Value. Pupils in the vocational classes of the Orange, N. J., schools, during the last year completed work having a commercial value of more than $10,000, according to Mr. B. D. Patrick, superintendent of schools. Of all the departments of the school, the printing shop turned out work valued at $4,668. The carpenter shop was next, with work estimated at $4,000, and the machine shop was third, with work having a value of $1,959.

Install Manual Training Department. The board of education at Columbus, Mo., has installed manual training equipment in the new Hickman school, which has been erected at a cost of $275,000.

Course in Vocational Supervision. A short course in the supervision and administration of vocational education was conducted during the summer at the Pittsburg Teachers' College, Pittsburg, Kans. The class was composed of 22 specialists from five states and was in charge of Mr. Frank Cushman, chief of the federal industrial education service.

Domestic Science Course. Domestic science has been added to the high school course of study at New Bremen, O.

Printing Plant Added. The Haverford township school board of Haverford, Pa., has added printing to the high school course.

New Vocational Courses. The high school at Champaign, Ill., has enlarged the course of study with the addition of courses in vocational guidance, home management, industrial arithmetic, business training, and auto-mechanics.

Vocational Courses. The school board of Lyons, Ia., has approved the introduction of vocational trade and industries in

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an aid to *instructors* tells how to select use and care for BITS!

Manual training instructors will find this illustrated 48-page booklet a real help in promoting class interest and an appreciation for good tools.

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There are detailed illustrations showing how bits are forged and machined, the parts of a bit and their functions, how to sharpen a bit properly, how to re-straighten the twist, and how the design of the cutting head is varied to meet the requirements of different classes of work.

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For the unusual need, Sta-Warm engineers create the correct equipment. If we can't save you money and trouble, we decline the order.

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the high school. The work will assume three phases, namely: home economics, agriculture, and trades and industries. The work is being offered under Smith-Hughes auspices and has the support of the state education department and the federal government.

Manual Training Equipment Installed. The board of education of Dayton, O., has made provision for manual training equipment in its new Lincoln Junior High School, estimated to cost $400,000.

Oregon to Receive Fund for Vocational Education. Beginning January 1, 1927, Oregon will receive $107,000 of federal funds for expenditures in vocational education. In high schools throughout the state, there are 29 schools of agriculture, seven in trades and industries, and three in home economics.

New Manual Training Quarters. The school board of Athens, Mich., has leased a residence and fitted it for use as a manual training shop.

Open New Art School. An art school will be opened this fall by the Detroit Society of Arts and Crafts at Detroit, Mich. A committee representing the public schools, the Detroit Institute of Arts, the Scarab Club, and other art interests of the city has been formed to direct the aims and policies of the school.

Chicago School Head Limits Trade-Work Space. The number and variety of technical shops to be installed in new high schools under construction in Chicago are to be strictly limited, as a result of a plan proposed by Supt. William McAndrew.

The report submitted to the board of education by the superintendent, asks specifically for each school that the two units designated for pottery and electricity be made into one unit for an automobile shop; that the unit for instruction in the crafts be changed to two classrooms; that the unit for weaving be changed to two classrooms, and that the unit for electric shop or sheet metal shop be left unfinished.

Under the plan, the following shops will be continued on trial: printshop, mechanical drawing, woodwork, and auto-mechanics. The shops to be eliminated are: machine shops, electrical shops, weaving, pottery, and home nursing.

Vocational Guidance. The board of education of Wheeling, W. Va., has introduced vocational guidance in the high school in order to discover the special ability of students and to direct them to the course of particular benefit to them.

Twelve Articles Made for Schools. A total of twelve different articles were made for the school buildings of Fond du Lac, Wis., by the students of the manual arts departments in the junior and senior high schools, according to a report recently submitted to the board of education. The articles ranged from tables, bulletin boards and ferneries to the cutting of materials to size for the grade schools. The value of the articles made for the schools was $28, and the total receipts of the department for the year amounted to $712, while the disbursements totaled $626.

Home Economics Cost Less than Cent Per Lesson. The average cost of each lesson in home economics at Fond du Lac, Wis., during the past year was eight mills, or one-eighth of a cent, according to Miss Margaret Minton, head of the home economics department in the senior high school. The class comprised 44 students and most of the food prepared by the students was used in the cafeteria. The low cost of the instruction was attributed to the sale of food in the cafeteria.

Students' Work Saves Money. The work of student plasterers, bricklayers, plumbers, and steamfitters on the new trade school to be erected at Detroit, Mich., will save $23,000 in construction costs.

New Printshop. A new shop has been built for the high school printshop at Somerset, Ky.

Industrial Education in Texas. The 1925-1926 program shows 24 cities in Texas offering 222 trade and industrial classes to 2,741 boys and men, and 1,380 girls and women, a total of 4,121 persons who are either already gainfully employed, or are preparing definitely to enter a trade. The classes are distributed as follows:

Thirteen cities are giving 51 well organized trade courses in day schools—47 for boys with an enrollment of 820, and four for girls with an enrollment of 59, a total of 879 young people in trade preparatory classes.

Two cities offer opportunity to boys and girls through part-time cooperative classes to learn a trade. Twelve groups enrolling 184 boys and 32 girls in auto-mechanics, machine shop work, mill work, and power machine operation are showing the value of this type of education.

Thirteen cities provide 144-hour part-time classes for employed young people. Twenty-nine are trade extension, enrolling 420 girls, and forty part-time general continuation classes, enrolling 193 boys and 701 girls, a grand total of 193 boys and 1,153 girls.

Twelve cities offer ninety trade extension courses for industrial workers, with an enrollment of 1,544 men and 168 women, or 1,712 adult workers.

The program offers instruction in shop or related technical subjects for 28 different trades. Mr. N. S. Hunsdon, state director, has general supervision for the State Board.

Cincinnati Graduates. The graduation exercises of the Cincinnati vocational schools were held August 6th at the Withrow high school auditorium. The graduates included 27 girls from the commercial service school, 21 from the retail selling school, 23 from the sewing trades school, 45 boys from the automotive trades school, 21 from the building trades school, 9 from the commercial service school, eight messenger boys, two mechanical trades school, 48 printing trades school, and four boys from the tailoring trades school.

(Concluded on Page 36a)

Have You a Little Paper in Your School?

The School News

A facsimile of the front page of a schoolpaper, such as may be published for the purpose of convincing parents of your children of the value of printing in connection with academic and vocational instruction in public schools.

VOL. 2 ANY COMMUNITY, ANY STATE NO. 1

The Value of Schoolpapers

WHAT the newspaper is to the general community the schoolpaper is to the school community. Both publications possess uncommon interest to their readers by the printing of news items, and both have the power of moulding public opinion. One influences mature minds; the other influences the youthful minds. Both are informative and highly educational. Especially is this latter statement true in the case of schoolpapers.

The schoolpaper has one distinct advantage in educational value—it is the product of its readers. To be successful it must represent the combined effort of every class in the school and be of interest to every student enrolled in those classes. The academic classes may be assigned the task of collecting news, preparing interesting articles, and revising the printers' proofs for errors in English construction, spelling and typography; the art classes may have charge of the illustrations and general typographic arrangements; the commercial classes may look after the business end of the publication, such matters as soliciting money for subscriptions or advertisements, making disbursements for paper, inks, etc. The actual work of type composition, imposition, presswork and binding will be done by the printing classes.

No other activity can combine into a single educational unity practically the entire facilities of the institution as does the schoolpaper.

With the installation of printing instruction in a school all the academic work is revitalized. English, spelling, arithmetic, grammar, and art will take on a different meaning to students who have hitherto regarded these studies merely as necessary evils. Taught in conjunction with printing, their great value as vital elements of education is realized.

Request us to send you a chart showing the "Mechanics of Journalism." It is free.

Information: The Education Department of the American Type Founders Company employs the services of professional educators, efficiency engineers and trained salesmen to aid you in establishing printing courses in your schools. With this Company the word "service" is spelled H-E-L-P.

For information write F. K. PHILLIPS, Manager, EDUCATION DEPARTMENT

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How unfortunate it is if a pupil is forced to work with an inferior wood. If he works in walnut, the article he creates will be treasured for years; may, indeed, become a family heirloom. The extra cost of walnut is small; give your pupils a chance to pay for it and so produce articles of permanent value.

Your pupils will find "The Story of American Walnut" an invaluable reference work.

AMERICAN WALNUT

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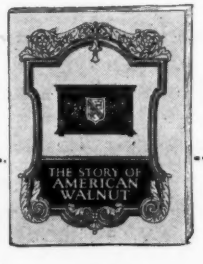

American Walnut Manufacturers' Association
Room 1280, 616 So. Michigan Ave., Chicago
Please send
"The Story of American Walnut"

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(Concluded from Page 34a)

The school board of Buckley, Washington, has engaged an agricultural instructor. The Buckley Banner says: "Modern farming is 85 per cent engineering. Farming employees will ultimately be paid wages as attractive as those offered to the skilled laborers in cities." Quoting a Montana Wheat Grower, the paper says: "We have worked out a method of power farming in connection with farm management which takes a great portion of the weather hazard out of farming in the great wheat growing states, especially in those where the rainfall averages some 14 to 15 inches a year. We feel that we can eliminate low-grade, transient labor which for years has come to the harvest fields. By substituting skilled mechanics we have greatly decreased the production cost per acre."

Survey of Artistic Talent. A survey of the junior high schools of Baltimore was recently made by the division of art education in order to discover artistic talent. The survey was made as the first step in providing special artistic training for talented pupils.

Night Schools Attended by Adults. Evening schools in New York City are now attended largely by men and women of mature years. Boys and girls, it is found, attend in decreasing numbers, because they find their opportunities in continuation schools and otherwise.

During the school year 1925-1926, evening schools were maintained in 90 centers. Instead of drives to enroll pupils, the effort is now made to improve the schools so that they will attract and hold non-English speaking people.

Minnesota School Health Poster Contest. A school health poster contest, with more than 150 prizes, has been announced as a feature of the 1926-1927 school educational work conducted by the Minnesota Public Health Association. The contest has four principal aims: (1) To encourage the correlation of health instruction with other subjects: (2) to stimulate the interest of school children in health: (3) to fix permanently in the pupils' minds concrete health facts; and (4) to promote the making of more artistic posters.

The schools of the state have been divided into three classes, each with a set of prizes, and comprising ungraded elementary schools; graded elementary schools with no instructor or special art supervisor; and graded elementary schools having a full-time art director or supervisor.

The prizes have been donated by business and educational organizations throughout the county and are valued at $2,000. A great variety of articles useful to the schools are included in the awards.

The contest is in charge of a committee composed of members of the state education department, art instructors, and school superintendents. It will come to a close on April 4, 1927.

THE AMERICAN VOCATIONAL ASSOCIATION LOUISVILLE, KY., DEC. 2, 3, 4, 1926

L. W. Wahlstrom

The first annual convention of the new American Vocational Association will be held on the dates given above. As our readers all know, this is the country-wide organization which continues the work of the Vocational Education Association of the Middle West and of the National Society for Vocational Education. After several years of negotiations these two major organizations have decided to join forces and enlist the support and membership of everyone interested in any form of practical arts education. Edwin A. Lee, director of vocational education, University of California, is president of the Association and the secretary is Z. M. Smith, state director of Vocational Education, Indianapolis, Ind. The spirit of service permeates the new organization, which aims to reach and benefit the teacher in the most remote hamlet as well as keep in touch with the needs of the big industrial centers. It is also a staunch supporter of the Federal Board for Vocational Education. Each of the state directors has a place in the House of Delegates which is the governing body of the organization.

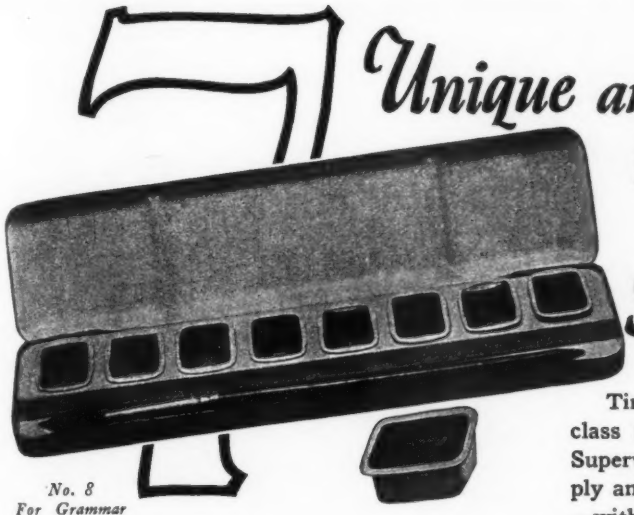
Louisville and the entire south are back of the convention. B. W. Hartley, superintendent of schools, has just successfully concluded a campaign for a $5,000,000 bond issue for new buildings. R. E. Daugherty, the supervisor of manual training and home economics, has a large staff of teachers who are doing excellent work. Evening schools and continuation schools are well organized and the visitor will have much to learn from visits to the various schools.

Forty years ago when manual training high schools were being established, one of Louisville's citizens established such a school which bears his name. The du Pont Manual Training High School has been a pioneer among schools of this type and prepares boys for engineering schools. The present principal, Mr. Chopin, has developed a very efficient faculty and a course of study which is particularly broad for a school of this type. It is well worth a visit to this school to observe the loyal spirit shown by both faculty and students to their school and their principal. This loyalty is exemplified by Mr. Gardner, the head of the shops, who has been with the school for 33 years and is a virile and enthusiastic teacher.

The new Theodore Ahrens Trade School will be a point of interest to visitors to the convention. This school is the new home of the Louisville Vocational School so successfully developed by Miss Ethel M. Lovell, the principal. The new school is made possible through the generosity of Theodore Ahrens, president of the Standard Sanitary Manufacturing Co. Mr. Ahrens, after visiting the school, which was in cramped quarters in the old Male

(Concluded on Page 39a)

Unique and Fascinating Uses for Classroom Work with "PRANG" School Water Colors



No. 8
For Grammar and High School use.

Time was when water colors were used in class for painting pictures only. Veteran Art Supervisors well remember when "Art" was simply another chore in the school day for students —without any particular "rhyme or reason."

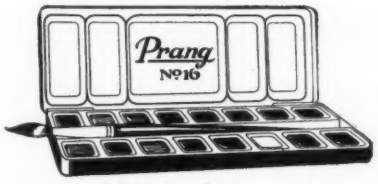
In the spirit of modern pedagogies, however, the "arts and crafts" idea in coloring work has replaced the "drill" —has substituted the fascinating for the dull; and the work has become ***fun***. The child sees the article to be finished and colored ***growing to completion under his hands***—an enormous educational advance.

No. 3A

Most popular box of cake colors in the country. Adapted for primary and intermediate grades.

No. 4

Popular for grade schools desiring semi-moist colors. Trays interchangeable with 3A. Strip of dozen refills may be obtained. In ordering refills, state box number.



No. 16

Assortment designed for those wanting extended pallette offering subtle differences in color tones. Semi-moist. Two brushes.

Art Supervisors will find our service and help a veritable "gold mine" of new and engaging ideas for classroom work with water colors—for example: Stick printing; decorating lanterns and holiday cards; the planning and making of holiday and gift booklets; the design and construction of waste paper baskets; stenciling on paper mats, scarfs, and blotter pads; painting certain kinds of posters; picture frames and draperies for classroom — these are a few of the many ways in which the modern teachers employ "PRANG" Water Colors.

We can suggest many more. Write us. Our long years of leadership in this field and the dominance of "PRANG" in Water Colors have naturally made us a sort of "clearing house" for new and novel school art ideas.

Make sure that the name "Prang" appears on the box—otherwise it is not "Prang."

"Prang" Water Colors and "Prang" Crayons are manufactured and owned only by The American Crayon Company. It alone is the original source of supply.

THE AMERICAN CRAYON COMPANY

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"Old Faithful"

SAN FRANCISCO **DALLAS** **NEW YORK**

LEADERSHIP SINCE 1835

91 Years of Faithful Service

The experienced pattern-maker knows it's *true* white pine. The old familiar qualities are there.

Let this company serve you from the largest supply of *genuine white pine* available from any one source. Write for details as to prices, facilities, etc., and for copy of "Sugar Pine Facts."

SUGAR PINE SALES COMPANY

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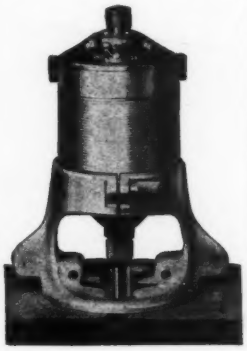
WONDERFULLY VALUABLE EQUIPMENT

Used in schools from HARVARD UNIVERSITY to PHILIPPINE ISLANDS and from MEDFORD, OREGON, to CUBA



Excerpts from a few letters:

From, John H. Klee, West Technical High School, Cleveland, Ohio

"I would rather part with any other equipment in my class room than give up the electric shaper."

From, J. L. Johnson, The New Jersey School for the Deaf, Trenton, N. J.

"We have been using Carter Products in the wood shop classes of our Industrial Department for the past two years. We are very much pleased and want more of them."

From, H. H. Braucher, University of Illinois High School, Urbana, Ill.

"After testing out your shaper and putting it into the hands of high school boys with unusually satisfactory results on their very first job, I have sent through a requisition. The tool justifies your claim of simplicity of operation, for it may be successfully used on simple work with little or no practice."

1/7 H.P. Router — $46.50
For Veining, Two-Tone Work, Beading and Fluting Spindles, Panel Sinking, Inlay Work, Mortising, etc.

1/4 H.P. Shaper — $121.00
For Jointing, Shaping and all decoration work not done by Router.

Write for Catalog and Requisition Blank with Suggestions.

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FRANK PAXTON LUMBER CO.

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BEST QUALITY **LOWEST PRICE**

KESTER *Self-Fluxing* SOLDER

Genuine Solder Containing its own Flux—Easy to Use—Requires Only Heat

In Your Radio Work—Use Rosin Core

In a radio receiving set the energy is very low and every precaution should be taken to prevent its loss. That is why leading radio manufacturers use Kester Rosin Core Wire Solder. It is the ideal solder for radio work.

With this smooth flowing virgin tin and lead solder the amateur can turn out absolutely safe, non-corrosive solder joints and at the same time have that finished appearance which you so much desire. Send for YOUR test samples.

KESTER *Acid Core* **SOLDER**

For general soldering on new or old work in the general shop, sheet metal shop, home mechanics shop, specify Kester Acid Core Wire Solder.

CHICAGO SOLDER COMPANY,
4259 Wrightwood Ave., Chicago, Ill.

Gentlemen:

Please send the following number of working samples:

.....Kester Acid Core Wire Solder

.....Kester Rosin Core Wire Solder

The number of boys in our shops are:

General Shop.....Electrical.....

Sheet Metal.....Home Mechanics.....

Signed.....

Instructor in.....School.....

City..... State.....

KESTER *Rosin Core* **SOLDER**

For all electrical soldering and radio work specify Kester Rosin-Core Wire Solder. Absolutely non-corrosive flux.

(Concluded from Page 36a)

High School, was so enthusiastic over the type of work Miss Lovell was doing that he provided a new building at a cost of $300,000. Other citizens have assisted the school board—completely equipping this building with up-to-date machinery for the various trades. The course includes part-time classes, general continuation, evening schools and two-year vocational courses. All of the basic industrial trades are included as well as commercial occupations. A unique course is that in bookbinding. This has long been a successful and prominent line of work. The excellence of instruction may be judged by the fact that for three consecutive years this school has carried off first prize at the meetings of the National Association of Bookbinders. The applied arts department of the school carried off five prizes at a recent poster contest of the National Safety Council.

Well, so much for Louisville. Now, what about "Kaintuck" and the south? W. S. Taylor, the genial dean of the College of Education of the University of Kentucky, is chairman of the state committee. The state is alive to all the latest developments in education. So interested are the educators in vocational education that the city and county superintendents are meeting at the same time so as to be able to attend the sessions of the A. V. A. In fact, the entire south is at present experiencing an increased interest in all forms of vocational education.

Visitors to the convention will also be interested in the many side tours within easy access of Louisville, which are being arranged by Mr. Daugherty. Who would miss a visit to that American shrine, the log cabin birthplace of Abraham Lincoln, if he found he was only 58 miles from the place and a convenient motor bus was at his door? Then there is the home of Stephen Foster who wrote "My Old Kentucky Home" near at hand, and Mammoth Cave, about a hundred miles away.

The exhibits will be bigger and better than ever. All the latest in the line of tools and equipment will be on board the "Ohio River Packet" in the lobby of the Brown Hotel. You'll want to hear the darkey quartet sing the old negro songs, you'll want to take part in the prize contests, and by all means "walk the gang plank." So don't fail to be on hand for all your old friends and many new ones will

"Look for you in Louisville."

REGIONAL CONFERENCE OF THE FEDERAL BOARD AT BLUE RIDGE, S. CAR.

Mr. J. C. Wright, director of the Federal Board for Vocational Education, reports that the recent regional conference held at Blue Ridge, S. C., for the southern states was one of the best thus far held in that section of the country. There were a total of 75 in attendance, every southern state being represented, fifteen coming from the far corners of Texas and a like number from Oklahoma.

The conference was in session six hours per day for two weeks and took up all forms of vocational work, discussing problems looking forward to improving the Smith-Hughes work in the south. There were present local supervisors, teacher trainers, and principals of local schools. It may be of interest to note that there was a foreman training group of twenty.

The conference is indicative of the increasing interest in industrial education throughout the south. Over two-thirds of the group were from the industries, many with salaries ranging from $6,000 to $6,500 per year. The high character of these conferences is unquestioned when the industries give such evidence of cooperation.

When the American Vocational Association meets in Louisville, Ky., on December 2-3-4 next, those in attendance may expect to learn some startling things regarding the awakened interest in vocational education throughout every section of the south.

PUBLICATIONS RECEIVED

An Industrial Calendar for Girl Workers. Paper, 54 pages. Issued by the Vocational Adjustment Bureau for Girls, New York City. The information contained in the pamphlet indicates the seasonal fluctuations in industries in New York City and offers information for the placing of girls in these industries. The industries are listed alphabetically for each month and include practically all branches of industry employing large numbers of women, or which have a large percentage of women workers. The material is printed on perforated pages, which may easily be removed and mounted on cardboard in calendar form for use in placement offices.

Vocational Education for the Retail Grocery Business. Bulletin No. 107, Series No. 5, May, 1926. Issued by the Federal Board for Vocational Education, Washington, D. C. The bulletin was prepared by E. W. Barnhart, chief of the commercial education service of the Federal Board, and seeks to present a training program for those engaged in the retail grocery business. It explains the operation of the training program and offers a sample of the instructional material for realizing the objectives of the program.

Agricultural Part-Time Schools. Bulletin No. 108, Series No. 27, May, 1926. Issued by the Federal Board for Vocational Education, Washington, D. C. The bulletin was prepared by J. A. Linke, and is intended for the promotion and establishment of agricultural instruction in part-time schools. It gives the objectives of part-time instruction, the qualifications of teachers, offers typical courses and methods of teaching, and includes a summary of minimum requirements and records and reports for use in the work.

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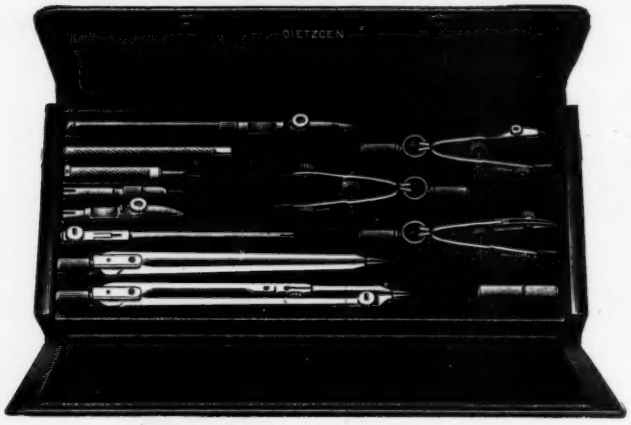
RELIABLE DRAWING INSTRUMENTS



Drawing set No. 1056 illustrated is one of the popular priced sets, and is especially adapted for school work. It contains six instruments and accessories and is sufficiently complete for all ordinary instruction.

The standardization of parts in the Dietzgen drawing instrument line is one of the distinct advantages of adopting Dietzgen Reliable Drawing Instruments.

Dietzgen instruments are designed and built to give a lifetime of accurate, reliable service. But should a part become broken or lost — there is no need to throw away the whole instrument—just order a new part through your dealer and the instrument is as good as new.

Write our nearest branch for descriptive literature.

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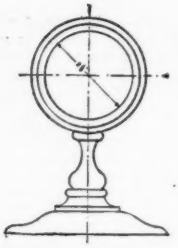
Drawing, Surveying & Mathematical Instruments & Materials, Measuring Tapes



Let us help you teach your boys, how to make clocks.

Hundreds of Schools the world over have found it a most fascinating project. It takes in a wide range of operations, drilling, sawing, moulding, wood turning, etc. We furnish full size blue prints of attractive, simple cases.

Write for our catalogue and details of our plan how you obtain our helps without cost.

We furnish works, dials, gongs, chimes, etc., for many styles of clocks from a little desk clock to the stately Grandfather's Clock.

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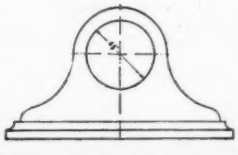
1677 Ruffner Street, Philadelphia.



BUYERS' NEWS

Trade Publications

A Textbook of Steel Saws. E. C. Atkins & Company, of Indianapolis, Ind., have issued a booklet of 31 pages under the title of "A Textbook of Atkins' Silver Steel Saws for Manual Training School." The booklet describes the care and use of steel saws and gives information about the material, grinding and finishing of saws, jointing, filing, etc. Each chapter is followed by a set of questions. The latter part of the booklet contains some useful facts and figures, a table of furniture dimensions, a table of sizes, lengths and numbers of nails per pound, and a list of suggestive projects for the school or home workshop.

Bookcraft. Donald M. Kidd, the Director of Vocational Education of Syracuse, N. Y., has done an exceptional piece of work in producing for Gaylord Bros., of Syracuse, a catalog entitled "Bookcraft." Mr. Kidd describes as practical teaching material, the process of re-binding all forms of books, and does it on the unit instruction basis with illustrations and teaching material of a most comprehensive character.

The catalog is opened by a glossary and index which describes the tools and materials to be used. The unit instruction sheets are prepared with the proper statement about processes of repairing, and finding the answers to the questions which are necessary to fix the purpose of the lesson in the mind of the pupil.

Gaylord Bros., of Syracuse, while describing their products, have produced a catalog which serves the purpose of instructing in the process of repairing books, rather than a mere selling of just so much merchandise.

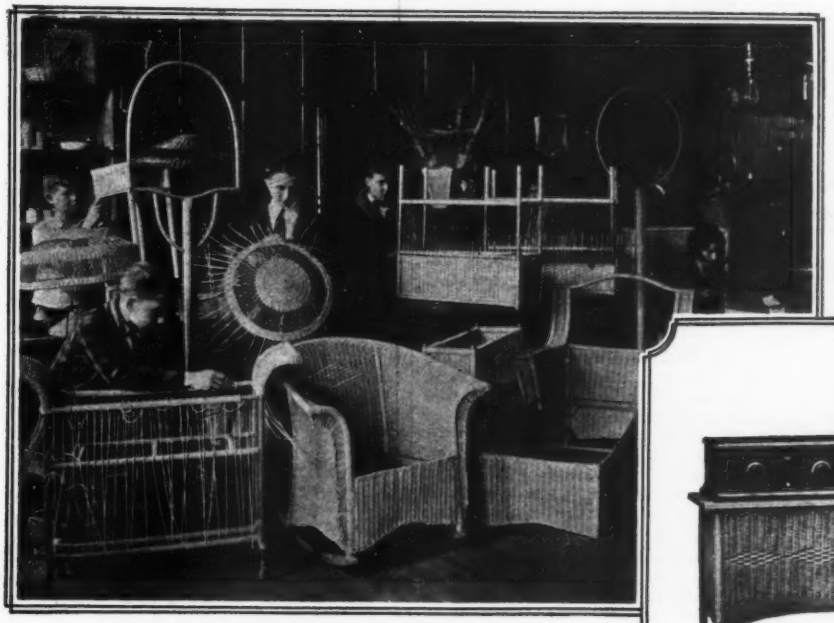
Without question this is one of the most interesting catalogs which has been prepared for school work. If more school catalogs are to render a greater school service, then more manufacturers must follow the plan of Gaylord Bros., in having the story of the product told by some schoolman from a school point of view.

Problems in Artistic Wood Turning

Earl W. Ensinger. Cloth, 72 pages. Price, $1.25. Bruce Publishing Co., Milwaukee, Wis.

While this book does not proclaim itself to be a text and does not contain the simple operations in turning, it does provide a well-rounded course of spindle and face-plate turning. If supplemented with the instruction which any good teacher gives, it will enable any student to gain experience in the widest variety of work. The problems are of the interesting and useful novelty and furniture types, carefully designed for good curves and proportions, and adapted to use in the average home.

Cooperative Service



Mary T. Brown, Lexington, Kentucky—found the directions so simple and complete that it was only necessary to start the pupils on the work and they continued unaided

RADIO CABINET No. 603-604

The materials and instructions for weaving this artistic Radio Cabinet will be sent to you postpaid for only $9.25. It is especially appealing to the student. It combines the features of attractiveness and usefulness to a high degree. What home, "be it ever so humble," has not a radio? The beginner need not fear to tackle it.

CLASSES in Art-Fibre weaving do not require specially trained instructors. This is an important fact. Many teachers have hesitated about using Art-Fibre in their classes, because, knowing little about it themselves, they were hesitant about instructing pupils.

The Grand Rapids Fibre Cord Company has published a book, "Art-Fibre Weaving," which takes care in advance of all the problems that might arise in the classroom. This teacher's manual gives clear and complete directions for every article.

It is so clearly written that the student can go ahead with but little assistance from the instructor. This is valuable, as it trains the student to follow directions accurately—a training that will prove invaluable to him in later life.

Our Cooperative Service Department is established and maintained for the teacher's convenience. It takes care of all questions arising in connection with this work, and any other information that they may desire.

OUR SPECIAL OFFER

To enable teachers to familiarize themselves with the wonderful possibilities of Art-Fibre weaving we offer, for a limited time only, this special combination of a serving or tea tray, waste-paper basket, and a smoking stand, all with Duotone Enamel finish, for only $2.35.

SPECIAL OFFER COUPON

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Please send me post paid complete materials for weaving and finishing a Fancy Basket, Serving Tray and Smoking Stand. Enclosed you will find $2.35.

I would like to have you send me your "Book of Designs" free—to teachers only.

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At last a STEEL TAPE that is genuine STAINLESS STEEL

The measure of a good mechanic — wherever good tools are used.

HERE, at last, is a steel tape that won't rust. Carpenters, builders, contractors, surveyors, mechanics—everybody who has used steel tapes knows how often they have to be scoured and what scouring does to a tape.

But this tape *can't* rust — it's made from genuine Stainless Steel. Use it in mud and water as much as you like —and then wind it up and forget it. It won't rust or stain, it will never need scouring or cleaning and the graduations will be as sharp and distinct after years of use as when the tape was new.

Made in 50, 75 and 100 ft. lengths of genuine Stainless Steel; graduated in feet, inches and eighths of an inch or in feet, tenths and hundredths of a foot. Quick reading figures—the foot mark is shown in a different size figure before each inch mark. Has leather case and push button handle. Ask your hardware dealer for Starrett Stainless Steel Tape No. 520.

You also get these same fine non-rusting qualities in Starrett Stainless Steel Rules, 6 and 12-inch lengths, hardened and tempered, and in 6-inch lengths flexible—graduated in 8ths and 16ths on one side and 32nds and 64ths on the other.

Starrett Dealers are displaying Starrett Stainless Steel Tapes and Rules the week of Oct. 9th—look for "the measure of a good mechanic" in your dealer's window.

If you're interested in fine tools, write for a free copy of the 352 page Starrett Catalog No. 23 "CE."

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World's Greatest Tool Makers
Steel Tapes—Standard for Accuracy

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STAINLESS STEEL
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Genuine Stainless Steel is manufactured only under the patents of the

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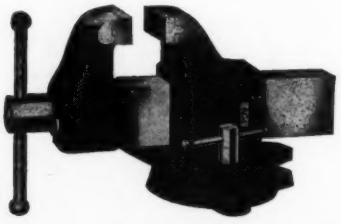

Respect for Good Tools

With the use of good tools comes respect. The pupil trained to the use of the best in tools — the tools he will find in the well-equipped shops of industry, starts with a decided advantage.

American industry is founded on quantity production and quantity production is possible only with the best tools.

Columbian Vises in shop or schools, enable the student to get the utmost service from other tools.

We'll gladly send illustrated literature and prices.

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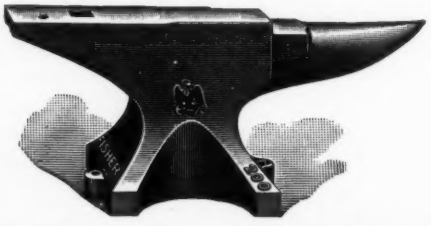
The standard anvil for Schools. No deafening ring. Lessons given and heard without interference.



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"HARD - TO - GET" MATERIALS

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Many items are of our own design and not obtainable elsewhere.

Our line has been greatly enlarged so as to permit the making of many new projects.

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Thurston Manual Training Supply Co.

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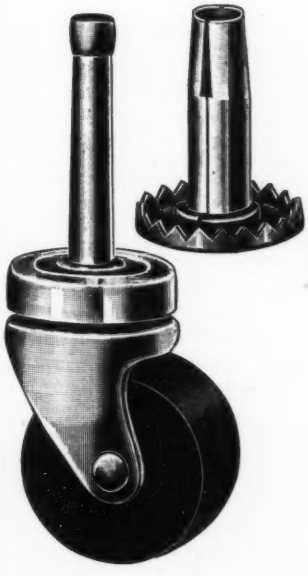

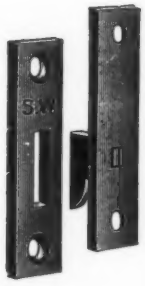

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SPHINX DRAWING INSTRUMENTS
Original Round System
Even Better School Instruments by WEBER

Requisition or recommend the finest school instruments ever sold under the name of Weber.

Increased production enables us to offer Improved Sphinx Drawing Instruments — better instruments at lower prices.

The large dividers and compasses have been improved with a straightening device in the head, acting at the same time as a steel bearing.

Improvements in the bow instruments and in the ruling pen.

All this in addition to those features so unmistakable in Weber instruments and so demanded—simplified design and the almost complete absence of set screws.

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The Century Vocational Series

EXPLORING THE MANUAL ARTS

By
JOHN F. FRIESE
Director of Manual Arts and Vocational Education, Vocational Guidance and Evening Schools, St. Cloud, Minnesota

A timely and well-informed discussion of the place and purpose of manual arts in the junior high school curriculum. It makes clear the significance and stresses the importance of non-manipulative and partially-manipulative methods which are investigative in character, points out the exploratory material which abounds in manual arts, and shows how junior high school teachers can vitalize their subjects through an intelligent use of this material.

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"PERMA" Pressed Crayon.

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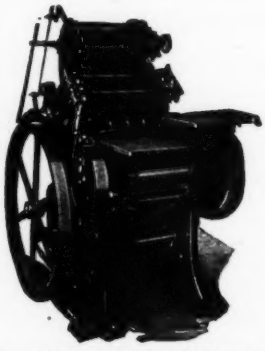

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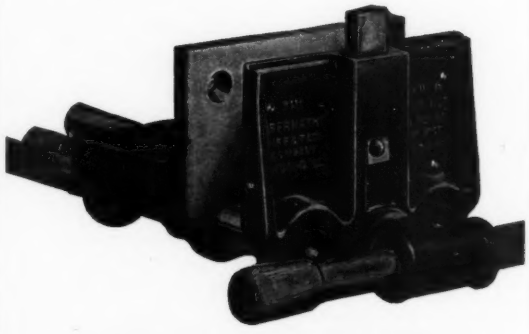

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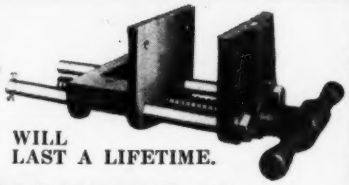

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Mummert-Dixon Co.
Oliver Machinery Co.

TWIST DRILLS
Cleveland Twist Drill Co., The
Greenfield Tap & Die Corp.

TYPE
American Type Founders Co.
Barnhart Bros. & Spindler
Empire Type Foundry Co.

UPHOLSTERING SUPPLIES
Lussky, White & Coolidge, Inc.
Sta-Warm Electric Heater Corp.
Thurston Manual Training Supply Co

VARNISHES
Devoe & Raynolds Company
Grand Rapids Fibre Cord Co.
Johnson & Son, S. C.

VISES
Columbian Vise & Mfg. Co., The
Fisher & Norris
Herriman-Campbell Company
Luther Grinder Mfg. Company
Millers Falls Company
Morgan Vise Company
North Brothers Mfg. Company
Stanley Rule & Level Plant, The

VISES—WOODWORKERS'
Abernathy Vise & Tool Co.
Columbian Vise & Mfg. Co., The
Christiansen, C.
Oliver Machinery Company

VOCATIONAL EQUIPMENT
National Manual Training Supply Co.

WATER COLORS
American Crayon Company
Binney & Smith Co.
Bradley Company, Milton
Devoe & Raynolds Co.
Weber Company, F.

WAX CRAYONS
American Crayon Company
Binney & Smith Co.
Bradley Company, Milton
Dixon Crucible Co., Joseph
Weber Company, F.

WEAVING MATERIALS
Englewood Top & Panel Co.
Grand Rapids Fibre Cord Co.
Thurston Manual Training Supply Co.

WOODWORKING MACHINERY
American Saw Mill Machinery Co.
Buffalo Forge Company
Crescent Machine Company, The
Gallmeyer & Livingston Company
Greenfield Tap & Die Corp.
Hall & Brown Woodworking Mach. Co
Heston & Anderson
Little Giant Company
Oliver Machinery Co.
Seneca Falls Machine Company
Sidney Machine Tool Company
Tannewitz Works, The
Wallace & Co., J. D.
Yates-American Machine Co.

WRENCHES
Greenfield Tap & Die Corp.
North Bros. Mfg. Company

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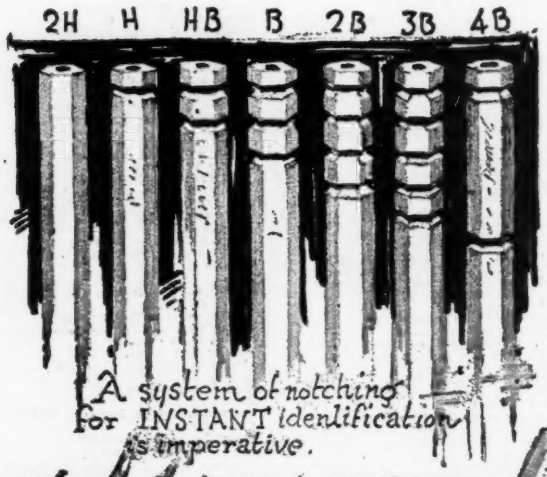
The ELDORADO PAGE

Sketching with "THE MASTER DRAWING PENCIL"



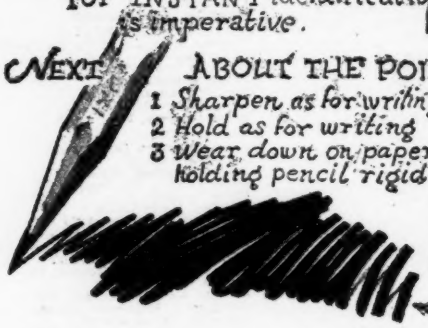
A system of notching for INSTANT identification is imperative.

What Pencils do you use?

A question so often asked that it will be answered without further delay.

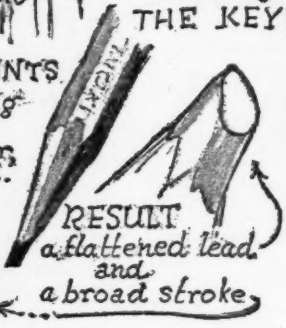
Here they are: seven of them - always carried in the left hand ready for the right!

Sometimes a 3H is also called in and a 5B is requisitioned for a black tone on a paper with a glazed surface. But these seven must always be at hand. Not that each pencil finds a use in every sketch any more than all the keys in the piano come into play in the rendering of every selection - BUT - THE KEYBOARD MUST BE THERE!

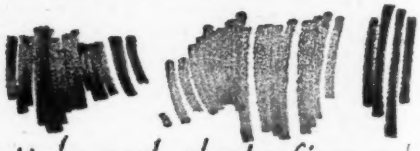


ABOUT THE POINTS

1 Sharpen as for writing
2 Hold as for writing
3 Wear down on paper, holding pencil rigid.



RESULT a flattened lead and a broad stroke

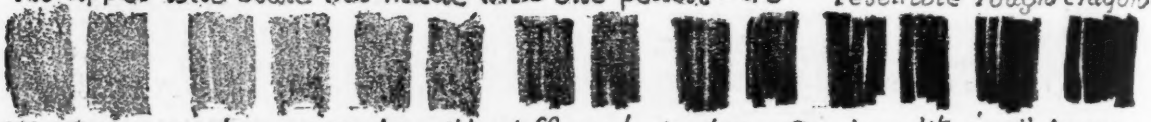


Make each stroke firm and definite with a swift, nervous movement.

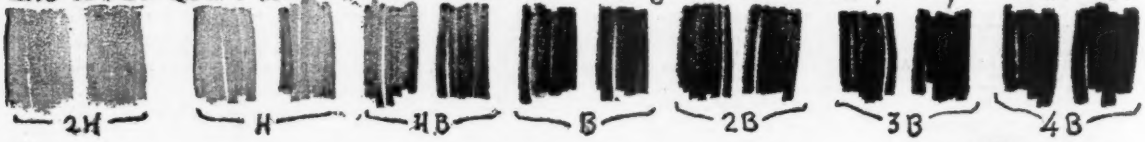
Insist on that BROAD STROKE

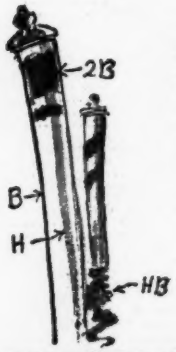
The upper tone scale was made with one pencil - 4B

The lighter tones resemble rough crayon



The lower scale was made with different grades. Good quality in all tones.



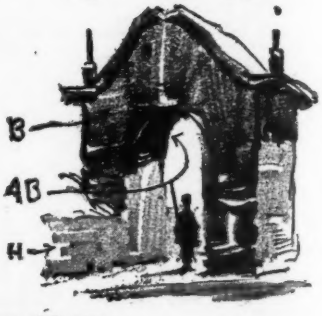


Bear on hard. Bite into the paper! IF the resulting tone is too dark take a harder pencil. Hard pressure does the trick. Light pressure with soft pencils gives a rough texture.

Have four or five extra sheets of paper under your drawing - a much more responsive surface. Use smooth paper.

Try the tone scale; until you can make a good one.

And you'll need ELDORADO to do it! Ernest W. Watson



THIS is one of a series of Pencil Lessons prepared by Ernest W. Watson. A portfolio of these lessons will be sent you on request. Write, too, for samples of Dixon's "Eldorado" and Dixon's "THINEX" Pencils—the latter for thin line checking and marking on drawings and blueprints. Both are supreme in their field. DIXON—PENCILS, Dept. 128-J, Jersey City, N. J.

The EQUIPMENT *of* SCHOOLS *for* TEACHING

PRINTING

should differ from standard in that the proportion of students to equipment is much greater than the proportion of type-setters to equipment in the standard commercial printing plant

The BARNHART SCHOOL RACK
affords the maximum of student accommodation within a minimum of floor space

But—with one exception—the difference should be of quantity, not of kind. The exception is that in the school printshop, in proportion to outlay for type, and type cases, the space for working or typesetting on top of the cabinets or case racks should be much greater than in the commercial plant. In the school, the need is to accommodate the maximum class of students at the minimum outlay for equipment, and usually the floor space is limited.

The Barnhart School Rack is designed especially for school printshops. It occupies but 32 x 39 inches of floor space—yet it provides two separate banks usable as drawing boards or type case rests for two students, allowing a third student non-interfering access to the type cases in the rack.

In the rightly equipped school printshop the student receives not only instruction and practice in typesetting—thereby learning in the only unforgetable way by *doing* with the hand the lessons of spelling, sentence construction, punctuation and the essentials of language—but learns also the uses of many different machines and acquires proficiency in the various practical tasks of mental and manual training: design value, color harmony, paper estimating and cutting, presswork, folding, stitching, binding, tableting, perforating, and punching, and other operations related to printing.

Printing experience gives to the student not only a knowledge of "the Art preservative of all the Arts," which is also the basic mechanical medium of recording and disseminating all Education—but prepares and interests him to progress more rapidly in further educational studies, and enables him to more successfully meet the problems of manhood's estate.

An Educational Department is maintained at our factory and general offices in Chicago to render free service in the selection of rightly balanced equipment for schools, and to co-operate with instructors in "Teaching with Type." Our branch houses carrying complete stocks in various cities are situated to deliver outfits promptly, at minimum cost, with a continuance of service advantageous to the school.

For Information and Estimates write the Educational Department, Monroe and Throop Streets, Chicago

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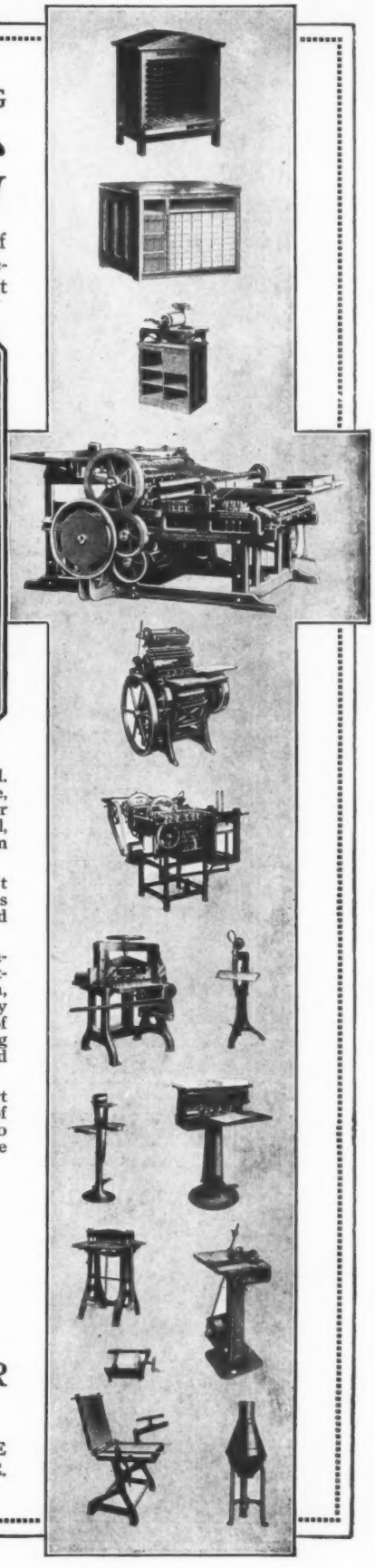

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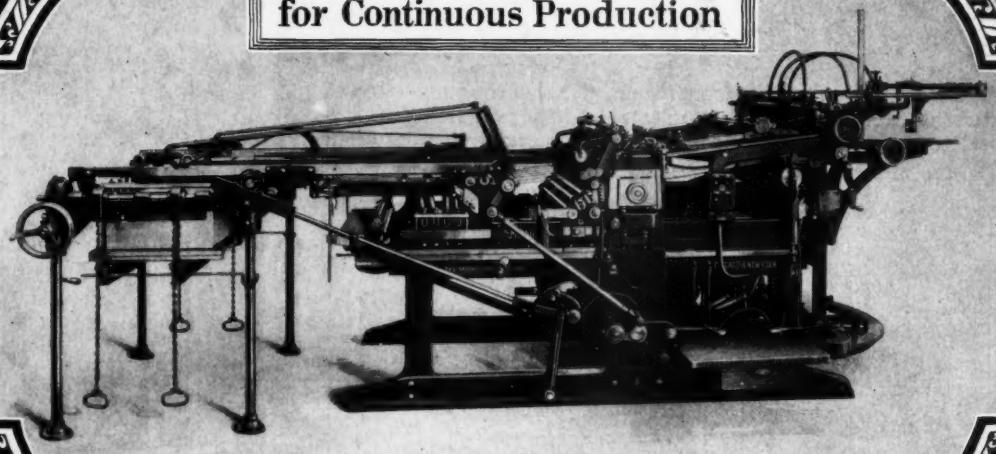

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MIEHLE AUTOMATIC PRESSES give you 1½ times as much work for the same payroll. This additional 50 percent will pay the whole cost of the new installation in a remarkably short time.

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